A COMPARATIVE STUDY ON OUTCOME OF SURGICAL MANAGEMENT OF VARICOSE VEINS WITH AND WITHOUT VENOUS STRIPPING

Dissertation submitted in

Partial fulfilment of the regulations required for the award of

M.S. DEGREE

In

GENERAL SURGERY – BRANCH - I

THE TAMILNADU

DR. M.G.R. MEDICAL UNIVERSITY

CHENNAI

APRIL- 2013.

CERTIFICATE

This is to certify that the dissertation entitled **"A COMPARATIVE STUDY ON OUTCOME OF SURGICAL MANAGEMENT OF VARICOSE VEINS WITH AND WITHOUT VENOUS STRIPPING"** is a bonafide work done by **Dr.S.M.Anandh**, Post Graduate student in Department of General Surgery,Coimbatore Medical College, under the supervision and guidance of **Dr.P.Swaminathan, M.S., D.O.,** Professor of Principles and Practice of Surgery, Department of General Surgery, Coimbatore Medical College, Coimbatore, in partial fulfilment of the requirement of **The Tamilnadu Dr.M.G.R.Medical University** for the award of M.S. Degree in General Surgery.

Prof.Dr.P.Swaminathan, M.S.,D.O.,

Professor of principles and practice of surgery,
Department of General Surgery,
Coimbatore Medical College,
Coimbatore.

Prof.Dr.P.V.Vasantha kumar, M.S.,

Professor & Head of the Department,
Department of General Surgery,
Coimbatore Medical College,
Coimbatore.

Prof.Dr.R.Vimala, M.D.,

Dean,
Coimbatore Medical College,
Coimbatore.

DECLARATION

I**, Dr.S.M.Anandh** solemnly declare that dissertation titled, **"A COMPARATIVE STUDY ON OUTCOME OF SURGICAL MANAGEMENT OF VARICOSE VEINS WITH AND WITHOUT VENOUS STRIPPING"** is a bonafide work done by me at Coimbatore Medical College Hospital, during September 2011- November 2012 under the guidance and supervision of **Prof. Dr.P. Swaminathan M.S.,D.O.,** Professor of Principles and Practice of Surgery, Department of General Surgery, Coimbatore Medical College, Coimbatore.

The dissertation is submitted to **The Tamilnadu Dr.M.G.R.Medical University,** towards partial fulfilment of requirement for the award of **M.S.Degree in General Surgery (BRANCH – I).**

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Coimbatore Medical College

COIMBATORE, TAMILNADU, INDIA - 641 014

(Affiliated to The Tamilnadu Dr. MGR Medical University, Chennai)

ETHICS COMMITTEE

CERTIFICATE

Name of the Candidate : DR. S.M. ANANDH

Course : M.S. GENERAL SURGERY

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College : COIMBATORE MEDICAL COLLEGE

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INTRODUCTION

Varicose veins are one of the oldest known diseases of mankind, since the beginning of written history. Varicose veins are dilated, elongated and tortuous veins. It is a progressive disease which worsens as day passes. Though not a very fatal disease the morbidity caused by this disease is more.

The treatment modalities available are conservative, surgical and endovenous therapies. The treatment option should be individualized based on their general condition and symptomatology of the patient.

In this comparative study the outcome of surgical management of varicose veins with and without venous stripping is compared and analyzed.

OBJECTIVES OF THE STUDY

The main objective of this comparative study is to compare the outcome of two surgical treatment modalities of varicose veins.

One group of patients undergoes Trendelenburg procedure with Subfascial ligation of incompetent perforators whereas the other group undergoes Trendelenburg procedure with Subfascial ligation of incompetent perforators with stripping of long saphenous vein from groin to knee.

The two modalities are compared in terms of

1. Hematoma formation in the thigh.
2. Healing of wounds in the leg at the site of incompetent perforators.
3. Comfortable ambulation without much pain on first post-operative day.
4. Postoperative hospital stay.
5. Pain relief of the patient after two months.

HISTORICAL REVIEW

The history of varicose veins dates back to the beginning of medicine. Mankind has suffered from varicose veins from long back and devised many treatment options till date. The word varicose means 'grapelike'[10].

Egyptians were first to describe varicose veins as "serpentine windings"3500 years ago. They thought that they should never be operated as the patient would be 'head to the ground'. According to them use of incision will lead to fatal hemorrhage.

The word varicose vein was first proposed by Hippocrates[11] in 460 B.C[10]. He wrote about compression following multiple punctures as an option for varicose veins. He related the leg ulcers with varicose veins.

A votive relief in Athens depicts an enormous human leg due to varicose veins.

Roman physician Celsus mentioned about the ligation and excision surgeries and their complications in his De Medicina. Galen and Celsus (25 B.C.) described phlebectomies which are followed even now.

Paulus Aegineta (625 – 690 A.D.) favoured ligation long back before Trendelenburg proposed. In his writings he mentioned that varicose veins can be operated similar to varicocele.

Oribasius of Pergamum, a Byzantine physician described about sequential excision of great saphenous vein[10]. Paul of Aegina (607-690), stressed upon the importance of saphenectomy.

In the 13th century called the era of master and barber surgeons[10], Ambrose Pare (1510-1590 A.D.), explained the importance of ligation at the varix.

In 1628 Harvey described about the venous valves and said that the to and fro movements of blood is not possible.

Wiseman (1676) found that venous dilatation may result in valvular incompetence. He was the one to use the term 'varicose ulcer'

Trendelenburg did ligation of Long saphenous vein at the mid-thigh[10]. Later his student perthes devised modern day flush ligation at sapheno femoral junction.

Recent advanced modalities include endovenous therapies like radiofrequency ablation, laser ablation, liquid and foam sclerotherapy[11], cutaneous lasers and intense pulse light therapy.

DEFINITION

There is no universally accepted definition for varicose veins[8]. In Latin varix refers to enlarged vein, artery or lymphatics. In routine usage the word varix is used to mention vein and varicosity refers to a vein that is enlarged in diameter and tortuous.

Varicose veins are superficial veins of the lower limb that has lost its valvular function and as a result of resulting venous hypertension becomes dilated, thickened and tortuous[8,20].

ANATOMY

A clear knowledge about venous anatomy of lower limb is essential to formulate the diagnosis and treatment of varicose veins[35].

The lower limb veins are classified into:

A. Superficial system[7,32]
    1. Great saphenous vein
    2. Small saphenous vein
B. Deep system[7,32]
    1. Anterior tibial vein
    2. Posterior tibial vein
    3. Peroneal veins
    4. Popliteal vein
    5. Femoral vein
C. Perforating veins
D. Communicating veins

The veins are named superficial and deep based on their location in relation to deep fascia of lower limb[5].

SUPERFICIAL VEINS OF THE LOWER LIMB

Great (long) Saphenous Vein:

Great saphenous vein which is the longest vein in the body starts from the medial aspect of the foot as the continuation of dorsal venous arch[5,7]. It passes along the anterior border of medial malleolus and then over the lower 1/3rd of tibia and along the medial border of the same in upper leg[4].

At the knee joint it passes poster medially about 10 cm from the front of patella. Then it runs upwards along the posterior part of medial condyle of femur and then along the medial aspect of thigh and pass into the saphenous opening (fossa ovalis) to end in femoral vein[7,4]. The confluence of saphenous and femoral vein lies about 2.5 to 3.5 cm below and lateral to pubic tubercle[2].

The saphenous vein is accompanied by saphenous nerve[7] in the leg and foot. At the knee it is accompanied by saphenous branch of descending genicular artery and in the thigh by branches of medial femoral cutaneous nerve.

The long saphenous vein receives number of tributaries all along its course which are as follows:

1. Posterior arch vein – in the leg a large constant vein which arises from a series of small venous arches.

2. In front of the leg an anterior vein from the ankle runs upwards and joins the long saphenous vein just below the knee.
3. A small tributary from small saphenous vein join the long saphenous vein.
4. In the thigh just before termination, an anterolateral and posteromedial branch join the saphenous vein.
5. The accessory saphenous vein is a possibility in the medial aspect of thigh joining the long saphenous vein in its upper part[7].
6. Just before the termination superficial epigastric, superficial external pudendal and superficial circumflex iliac veins join the saphenous vein[3].
7. Vein of Giacomini is an important vein to be mentioned[1]. It extends from the great saphenous vein in the thigh, passes postero-inferiorly around to the popliteal fossa and joins the short saphenous vein, a little below its insertion into popliteal vein. The importance is that it can transmit great saphenous vein reflex down to short saphenous vein and give a spurious appearance of saphenopopliteal incompetence.

The great saphenous vein is normally 5-6 mm in thigh and 2-3 mm in the calf. It usually has 10-12 valves and in the thigh it is usually within saphenous compartment. Sometimes there may be double GSV in the thigh which if left, results in early recurrence.

Small (short) saphenous vein:

Small saphenous vein starts from the lateral side of dorsal venous arch and passes posterior to lateral malleolus and then along the posterior midline in calf[5]. It pierces the deep fascia in the upper part of the calf and enters the popliteal fossa.

The confluence of small saphenous vein with popliteal vein is highly variable[3]. Usually it enters 2-3 cm proximal to transverse skin crease at the back of the knee. Sometimes joins the popliteal vein above the skin crease at variable distance. The confluence is usually medial or lateral side of the popliteal vein rather than posterior. Very rarely it extends into the thigh and opens into femoral vein.

It receives many tributaries from the back of the leg. It is closely related to sural nerve in the leg[3].

DEEP VENOUS SYSTEM:

The deep veins in the leg originate from the deep plantar venous arch. The three main deep veins of the leg are anterior tibial, posterior tibial and peroneal veins. The posterior tibial vein and peroneal vein usually join together to form tibioperoneal trunk. All three veins join to form popliteal vein in the knee and it passes upwards and anteriorly, through adductor canal in the distal thigh where it is

called as superficial femoral vein. Here it is joined by deep femoral vein to form a common femoral vein which continues as external iliac vein.

SINUSOIDS

There are two main venous spaces in the calf region which are in communication with deep venous system[3]. They are the soleal sinusoids which usually communicate with posterior tibial vein and the gastrocnemius sinusoids which communicate with popliteal vein[5,32]. The blood pooled in the sinusoids is pumped into the axial veins during muscle contraction.

PERFORATORS:

These are transfascial veins that communicate the deep venous system with superficial system[5]. They may be either direct type or indirect type. Direct perforators directly connect the superficial and deep veins. Indirect perforators enter into the deep fascia and open into a vessel in muscle which in turn joins the deep vein. Under normal circumstances they allow the blood to pass from superficial to deep system only[1]. The named perforators are ankle perforators (Cockett), below knee perforator (Boyd) and midthigh perforator (Dodd) [7]

A. Foot perforators
    1. Dorsal foot or intercapitular perforator
    2. Medial perforator

3. Lateral perforator
4. Plantar perforator

B. Ankle perforators

1. Medial perforator
2. Lateral perforator
3. Anterior perforator.

C. Leg (calf) perforators

1. Paratibial perforator
2. Posterior tibial (formerly Cockett's) perforators
3. Anterior leg perforator
4. Lateral leg perforator
5. Posterior leg perforator

D. Knee perforators

1. Medial knee (formerly Boyd's) perforator
2. Suprapatellar perforator
3. Lateral knee perforator
4. Infrapatellar perforator
5. Popliteal fossa perforator

E. Thigh perforators

1. Medial thigh (formerly Hunter's) perforator

2. Anterior thigh perforator
3. . Lateral thigh perforator
4. Posteromedial perforator
5. Sciatic perforator
6. Posterolateral perforator
7. Pudendal perforator

F. Gluteal perforators

1. Superior gluteal perforator
2. Midgluteal perforator
3. Lower gluteal perforator

COMMUNICATING VEINS

These are small veins which connect the different veins of the superficial system or deep system[32].

THREAD VEINS AND RETICULAR VEINS

Thread veins, reticular veins, spider veins are spectrum of veins of varying sizes that are in and under the skin[1,3].

PHYSIOLOGY OF LOWER LIMB VEINS

In the erect posture, blood tends to pool in the lower extremity due to gravity. This is to be pushed into the heart against the gravity. This is done by the contraction of muscles of the limb which act as peripheral heart and presence of competent valves which prevent retrograde flow. Under normal circumstances about 90% of venous return is through deep system and the flow in perforators is one way, superficial to deep.

In the supine position the resting venous pressure in the foot is the sum of residual kinetic energy minus resistance in the arterioles and precapillary sphincters. The pressure gradient to right atrium is about 10-12 mm hg. But in erect posture resting pressure of the foot is actually the hydrostatic pressure from the upright column of the blood extending from the right atrium to the foot. The factors which help in venous return in lower limb are:

1. Venous valves
2. Calf muscle
3. Vis a tergo
4. Negative intrathoracic pressure

Of these the presence of competent valve is an important factor.

1. VENOUS VALVES:

The peculiarity of lower limb and upper limb veins are pressure of valves both in superficial and deep system[5]. The valves are usually located distal to the junction of tributaries. The valves are bicuspid, allowing prograde flow only. The valves are delicate yet they can withstand pressure for about 300 mm Hg[8]. If the valves are damaged, then the varicosity results due to pooling of blood.

2. PERIPHERAL HEART:

The blood in the leg is pumped towards the heart by soleus and gastrocnemius which act as peripheral heart[22]. When the muscle contracts the pressure within the compartment rises to 200 to 300mmHg[2]. This pushes the blood upwards and the retrograde flow is prevented by competent valves. Once the muscle relaxes the pressure within the deep system falls sharply and the blood from superficial veins flow into deep veins[7].

3. VIS A TERGO:

The venous return to the heart is caused by the Vis a tergo (force from behind) of the heart.

4. PRESSURE IN THE THORAX:

The blood flow towards heart is also caused by the negative intrathoracic pressure.

EPIDEMIOLOGY

Varicose veins are an extremely common condition that has a significant impact on an individual's health. During the period of 1930s to 1960s the prevalence was roughly around 2%. As per the recent studies, the prevalence of varicose veins is about 5-30%[1] and that of venous ulcer is 1% in adult population[1] .As per the Framingham study, the incidence is about 2.6% in women and 1.9% in men. In a large population sample in UK overall prevalence of SSV reflex is 10%[1]. Spider veins are seen in 25% of population[3]. The ethnic difference in the incidence is shown by San Diego population studies. According to their results, the varicose veins are most prevalent in Hispanics (26%) and least prevalent in Asians (19%)[1].

ETIOLOGY

Various factors predispose to the development of varicose veins. Varicose veins may be primary or secondary.

Primary varicose veins are idiopathic. Secondary varicose veins are due to other disorders of vein.

1. **Hereditary Factors:**

There are few evidences supporting the hereditary nature of the disease[1]. The children with both parents being affected with varicose veins have two fold chance of getting the disease[22]. The studies of incidence in identical twins also support this. Although the specific gene is unknown, the gene mutation of FOXC2 is commonly associated with varicose veins[2].

2. **Age Factor:**

The incidence of varicose veins increases with increase in age[7]. This is probably due to change in vessel wall and its components. As age advances the elastin content of the vessel wall decreases which may decrease the pliability of vessel wall.

3. **Sex:**

Clearly females are more prone for varicosities than males[8]. This is due to several factors like progesterone[22,21] which causes dilatation of the vein and hence

the secondary valvular incompetence[7], pelvic tumours causing obstruction to venous return and gravid uterus which exerts pressure on the veins.

4. Deep vein thrombosis:

When the deep vein is occluded the blood is diverted into the superficial system causing progressive dilatation, lengthening and damage to the valves resulting in varicosity[8].

5. Others:

The other factors which contribute to varicosities are prolonged standing, height, race, occupation, bowel habits, abdominal mass compressing upon the veins, congenital weakness of vessel wall and congenital absence of valves[2,1].

SECONDARY VARICOSE VEINS:

Mostly this results as a result of post phlebotic syndrome[22,32]. After sometime when the thrombosed vein recanalises[8,32], the valves get damaged in the recanalization procedure resulting in varicosity.

Varicose veins in the young age may be due to any arteriovenous malformation or congenital absence of valves. One condition where varicosity occurs on lateral aspect of limb extending for its full length is Klippel Trenaunay syndrome[1]. The affected limb will be usually longer than the other.

Factors for thromboembolism (secondary varicose veins):

1. Obesity
2. Age factor[7]
3. Bed ridden status
4. Pregnancy
5. Estrogen[7]

High risk:

1. Long bone fracture and surgery
2. Major abdominal surgeries for malignancy
3. Aged patient with previous history of DVT undergoing any surgery

Other risk factors:

1. Inflammatory bowel disease
2. Nephrotic syndrome
3. Infection
4. Paralysis of lower limb
5. Polytrauma

PATHOGENESIS

Various factors play role in pathogenesis of varicose veins.

1. The defect in the vessel wall which can be generalized or localized will result in dilatation of vessel wall and hence secondary valvular incompetence[8]. This fact is being supported by the decrease in elastin content of varicose veins.
2. The anatomical differences in the location of superficial veins play a role. For example, unlike the axial veins, the minor tributaries are less supported in the subcutaneous fat and are prone to varicose[7].
3. The defect may be in the valve which results in pooling and varicosity. It is usually seen in post DVT limb[1] where the valves are damaged and in cases of congenital absence of valves[8].
4. The varicosity may arise due to defect in the valves of communicating veins, where blood enters from deep to superficial system[1].
5. The most important factor in the pathogenesis of varicose veins is venous hypertension which is because of two reasons. One is hydrostatic pressure which is the weight of the blood column from the right atrium. The second is the dynamic pressure created during muscle contraction which is transmitted to superficial veins in case of valve incompetence, resulting in dilatation and lengthening[7].

The pathogenesis of secondary varicose veins is different where the varicosity occurs due to different venous abnormality most common of which is DVT. Due to occluded deep venous system, entire blood passes along superficial system causing distension and valve damage. The other causes for secondary varicose veins are Klippel Trenaunay syndrome and arteriovenous fistula[8].

In primary varicosity the disease progresses from above downwards which means that the high pressure above the valve dilates the vein and it becomes incompetent. In case of secondary varicosity the disease process is from below upwards. If the varicosity is due to arteriovenous fistula, the disease progresses on either direction.

Ochsner and Mahorier proposed the following features in full blown varicosity

1. Elongation and tortuosity
2. Ectasia or dilatation
3. Change in vein wall thickness
4. Loss of elasticity
5. Thickened intima
6. Thrombosis and calcification.
7. Enlarged collaterals
8. Atrophied valves
9. Change in muscularis.

CHANGES IN MICROCIRCULATION

Changes in hemodynamics of larger veins is reflected in smaller veins which results in venous microangiopathy resulting in elongation, dilatation, tortuosity, damage to endothelium of thread veins, reticular veins[1].

Fluid movement across the capillary is determined by the relative osmotic and hydrostatic pressure on either side. Whimpster (1956) showed that venous hypertension impedes the fluid reabsorption at venous end of capillary resulting in edema.

As a result of increased venous pressure and increased permeability of vessels fluids, blood cells and other molecules extravasates into extravascular space[1]. The extravasated RBC lyses and produces hemosiderin causing hyperpigmentation and subsequent mast cell activation causes itching. Fibrinogen accumulation causes thickening and lipodermatosclerosis[7,35]. For some unknown reasons, blood fibrinolytic activity is markedly reduced in patients with liposclerosis.

PATHOGENESIS OF VENOUS ULCER

Varicose ulcers typically occur at the ankle called the ‘gaiter’s area’. The two main causes for ulceration are white cells trapping and fibrin cuff formation[22,1].

In case of venous hypertension[32,15], the arteriovenous pressure difference decreases and hence the blood flow in capillary slows down. As a result the white cells are trapped in the capillaries and result in decreased flow and hypoxia. Moreover the adhered white cells release proteolytic enzymes and oxygen free radicals causing tissue damage[7].

According to fibrin cuff theory, the fibrinogens that escape from the capillaries polymerize and form an insoluble cuff around the capillaries. This impedes the oxygen and nutrient supply to the adjacent tissues producing cell death[1].

CLINICAL FEATURES OF VARICOSE VEINS

The most common symptom of patients with varicose veins is dull aching pain after prolonged standing at the end of the day[2]. The other reasons for which patient come to doctor are leg swelling, night cramps, skin pigmentation, itching, dilated veins causing cosmetic problem, complications like eczema, ulceration, bleeding.

SYMPTOMS

1. Pain [2]

The pain is dull aching[27] in nature usually felt after prolonged standing, sometimes even soon after getting from the bed. Sometimes patients experience night cramps due to sustained contraction of calf muscle, which is usually relieved by massaging or walking.

2. Swelling

The swelling of the leg is well noted after prolonged standing. This is due to extravasation of fluid and collection in subcutaneous tissue which also causes heaviness.

3. Dilated veins

Many patient consult doctor for the cosmetic reason. Due to chronic venous stasis, the veins dilate and lengthen so as to accommodate the pooled blood.

During lengthening of vein, since the vein is fixed at the sites of perforators, it acquires a tortuous course.

4. Pigmentation and Itching[7]:

Patients frequently come with pigmentation and itching around the ankle. This is due to the deposition of hemosiderin from the lysed hemoglobin and subsequent mast cell activation.

5. Ulceration[2,5]:

Ulcers are usually superficial and over the medial aspect of ankle. They are usually circular or oval with sloping edge and granular floor.

6. Bleeding:

Sometimes patient present with active bleeding from the dilated vessel[2]. As the veins are dilated they get easily injured.

PHYSICAL FINDINGS

On examination of a varicose leg, one should look for dilated tortuous elongated veins[2] and its extent. The other findings are edema, brawny induration, saccules of veins, dermatitis, ulcer, reticular veins and thread veins[2].

Venous ulcers[8] are common in the lower one third of the leg, as the impact of venous hypertension is more here. Ulcer is usually posterosuperior to medial malleolus in long saphenous varicosity and near the lateral malleolus in small

saphenous vein pathology. These are usually solitary oval superficial ulcer with sloping edge. The surrounding skin is usually hyper pigmented and shows brawny induration.

COMPLICATIONS OF VARICOSE VEINS

1. BLEEDING

Severe bleeding[30] can occur from the varicose veins due to trivial trauma. In such case, the limb should be immediately elevated and a firm pressure should be applied to stop bleeding[8].

2. EQUINOUS DEFORMITY

Patients with varicose ulcer tend to walk on their toes to decrease the pain. Chronicity of this habit causes contracture of Achilles tendon and hence the equinous deformity.

3. PERIOSTITIS TIBIA

In long standing cases the ulcer deepens and involves the periostium of tibia resulting in periostitis and osteomyelitis.

4. LIPODERMATOSCLEROSIS

In chronic cases, the region around the ankle becomes pigmented and thickened due to progressive accumulation of extravasated fibrin resulting in lipodermatosclerosis[7].

5. THROMBOPHLEBITIS[27]

The varicosed superficial veins may get inflamed and thrombosed, they look red, feel warm and are painful[8]. On palpation they are felt like cords. Sometimes calcifications occur in the thrombosed veins.

6. MARJOLIN'S ULCER

Long standing venous ulcer can undergo malignant transformation rarely. Whenever the chronic ulcer is not healing, with features of malignant ulcer the possibility of Marjolin's should be thought. A biopsy from the edge of the ulcer will yield diagnosis. It is a type of low grade squamous cell carcinoma.

CLASSIFICATION OF VARICOSE VEINS

The older classification for varicose vein is Widmer classification. Recently the CEAP classification was devised and proposed in American venous forum meeting in 1994. This classification includes four elements: the **C**linical presentation, **E**tiology, **A**natomical areas affected, **P**athophysiology[8,3]. A simplified version of CEAP was put forward by Bergan.

1. WIDMER CLASSIFICATION[8]

Hypen webs	Venous telangiectasia, spider veins
Reticular veins	Dilated tortuous subcuticular veins
Truncal veins	Dilated tortuous long saphenous vein
	Short saphenous vein or its tributaries
CVI grade 1	Venous flare at ankle 'corona phlebectatica'
CVI grade 2	Hyper or depigmented area in gaiter area
CVI grade 3	Open or healed venous ulcer

2. REVISION OF CEAP[1,7]

Clinical classification

C0: No visible or palpable signs of venous disease

C1: Telangiectasias or reticular veins

C2: Varicose veins

C3: Edema

C4a: Pigmentation or eczema

C4b: Lipodermatosclerosis or atrophie Blanche

C5: Healed venous ulcer

C6: Active venous ulcer

S: symptomatic, including ache, pain, tightness, skin irritation, heaviness, and muscle cramps, and other complaints attributable to venous dysfunction

A: asymptomatic

Etiologic classification

Ec: Congenital

Ep: Primary

Es: Secondary (post thrombotic)

En: No venous cause identified

Anatomic classification

As: Superficial veins

Ap: Perforator veins

Ad: Deep veins

An: No venous location identified

Pathophysiologic classification

Basic CEAP

Pr: Reflux

Po: Obstruction

Pr,o: Reflux and obstruction

Pn: No venous pathophysiology identifiable

Advanced CEAP: Same as basic CEAP, with addition that any of 18 named venous segments can be used as locators for venous pathology.

CLINICAL TESTS

There are various clinical tests to assess the varicose limb[9].

1. TRENDELENBURG TEST I AND II
2. MULTIPLE TORNIQUET TEST
3. PERTHES' AND MODIFIED PERTHES' TEST
4. PRATT'S TEST
5. FEGAN'S TEST
6. SCHWARTZ TEST
7. MORRISEY'S COUGH IMPULSE TEST
8. MOSES AND HOMAN'S SIGN

1. **Brodie Trendelenburg tests:**

This helps in finding whether the varicosity is due to saphenofemoral or perforator incompetence[24]. The patient is put in supine posture, leg raised and veins emptied. The saphenofemoral junction is occluded with thumb and the patient is asked to stand. The pressure at the saphenofemoral junction is removed. If the vein rapidly fills from above downwards, it signifies saphenofemoral incompetence. This is called Trendelenburg test I[9].

In the second part, after emptying veins and occluding the saphenofemoral junction, the patient is asked to stand and the pressure is not released. If there is

filling from below upwards, it is due to perforators incompetence. This is the second part of the test and called Trendelenburg test II.

2. Multiple tourniquet test:

After emptying the superficial veins, multiple tourniquets are tied at various levels and patient is asked to stand. From the segments that dilate, the particular perforator which is incompetent is identified[9].

3. Schwartz test:

In the chronic case, when the vein is tapped at its lower end with one end, the impulse can be felt by the other hand placed at the saphenofemoral junction.

4. Morrissey's cough impulse test:

In case of saphenofemoral incompetence, an impulse can be felt in the thumb placed at the saphenofemoral junction due to turbulence of blood reflux[2]. Alternatively a bruit may be heard on auscultation.

5. Perthes' test[24]:

After elevating and emptying the superficial veins, an elastocrepe bandage is applied and patient is asked to walk. If the patient has deep vein thrombosis, there will be severe cramping pain in leg[9].

6. Modified perthes' test:

Here, a tourniquet is tied at the thigh and the patient is asked to walk. If the deep venous system and the perforators are competent the veins should shrink. If the deep system is blocked, the veins will dilate further[9].

7. Fegan's test:

First in the standing posture the bulges along the course of the vein are noted and are marked. Then the patient is put in supine posture, vein emptied and at the marked sites defects in the deep fascia are felt. These defects are the site where perforators pass through[9]

8. Pratt's test:

An elastic bandage is applied and the vein is emptied. A tourniquet is applied at the saphenofemoral junction to occlude it. Now an elastic bandage is applied from below upwards. The site of perforators are seen has blowouts and are marked[9].

9. Homan's test:

Dorsiflexion of foot causes severe cramping pain in the calf in case of deep vein thrombosis.

10. Moses test:

Moses test is squeezing of calf muscles to look for tenderness which will be seen in DVT.

INVESTIGATIONS

A thorough clinical examination in good light will give the maximum information about the varicosities. In order to avoid recurrence due to anatomic variations in the leg veins and to mark the exact site of incompetent vessels for easy surgical approach with minimal incisions and to rule out DVT imaging studies are now routinely done.

A. NON INVASIVE TECHNIQUES:

1. Doppler flow meter
2. Measurement of change in limb volume
    a. Photoplethysmography
    b. Air plethysmography
    c. Fluid plethysmography
    d. Electrical impedance plethysmography
3. Venous duplex imaging

B. INVASIVE TECHNIQUES:

1. Functional phlebography
2. Varicography
3. Ambulatory venous pressure
4. Intravenous ultrasound

A.NONINVASIVE TECHNIQUES

1. DOPPLER EXAMINATION

It is the gold standard non invasive modality to assess the venous reflux[35].When blood flows across the probe which contains transmitting and receiving crystals, it emits sound. The uniphasic signals indicate unidirectional flow whereas biphasic flow indicates flow in both directions[2]. The signal can be augmented by squeezing the calf or dorsiflexing the foot[14]. It has a good sensitivity in detecting superficial venous pathology and to some extent that of deep. Its sensitivity to short saphenous incompetence is less as it's termination with popliteal veins is highly variable.

2. MEASUREMENT OF CHANGE IN LIMB VOLUME

This can be done by photoplethysmography, air, fluid and electrical impedance plethysmography[1]. In photoplethysmography relative changes in the blood volume in the dermis of the limb are calculated by measuring the light scattered back with a probe containing photo sensor. The probe placed on the foot and the calf muscles are repeatedly contracted to empty veins from the foot. Then the time required for the veins to refill is calculated. A refill time of less than 18-20 seconds indicates chronic venous insufficiency[1]. This holds well for superficial incompetence but not for deep veins. Air photoplethysmography involves the

measurement of change in limb volume by the displacement of air in the cuff around the limb.

3.VENOUS DUPLEX IMAGING

This allows grey scale imaging[2] of vein with red/blue colour superimposed depicting the direction of flow. The advent of duplex imaging[23] has revolutionized the vascular field. It combines B-mode colour flow imaging and pulsed Doppler assessment of flow direction[1,14]. Imaging is done in standing posture[16].The direction of flow can be assessed by provocation like valsalva, distal compression of calf[16]. Reversal of flow lasting for more than 0.5 seconds in superficial system implies incompetence[1]. In case of deep system more than 1 second reversal signifies incompetent valves. The duplex provides the following data[8,32]

1. Duration and velocity of venous reflex
2. Patency and competence of deep veins
3. Site and level of major incompetence
4. The exact point of confluence of small saphenous vein and popliteal vein
5. To detect the anatomical variations.

Duplex imaging provides good information about the vein valve cusps and other anatomical and functional details. It has replaced all the other investigations of chronic venous insufficiency because of its high sensitivity and specificity.

B.INVASIVE TECHNIQUES:

1. Venography

Venography or phlebography[22] is the method of studying venous anatomy by injecting contrast into it[2]. It can be either ascending or descending phlebography[7,32].

Indications:

1. To assess the deep venous system while planning for treatment of superficial system

2. To assess the recurrent varicosities

3. In case of deep vein thrombosis, the site and extent of thrombus can be visualized.

4. To image the venous malformations

Procedure

A tourniquet is applied around the thigh. The contrast material used should be non-ionic, non thrombogenic, iso osmolar to the blood. One of the veins in foot is canulated and contrast material is injected and a film is taken. Then the thigh tourniquet is released and some more contrast is injected and a second film is taken. Thrombus will be seen as filling defect. Retrograde filling signifies perforator incompetence. It will differentiate between the primary and secondary disease and provides good anatomical details.

Complications:

Allergic reactions and anaphylaxis can occur. Post phlebography thrombosis can occur.

2. VARICOGRAPHY

Here the contrast is directly injected into the varicosities. The contrast passes along the course till termination. This is particularly useful in patients with vulval varicosity and abnormal refluxing vein which are sometimes not picked up by duplex examination[2].

3. AMBULATORY VENOUS PRESSURE:

This is the gold standard for the evaluation of chronic venous insufficiency[1]. Here there is a needle inserted into a pedal vein. The needle is connected to a pressure transducer. The pressure is monitored at rest and during exercise. The factors usually measured are mean ambulatory venous pressure and the refill time. The normal range of mean ambulatory venous pressure is 20 – 30 mmHg[1]. Nowadays this is not routinely used in clinical practice.

4. INTRAVASCULAR ULTRASOUND

It is rapidly gaining acceptance in recent days. It uses a catheter based ultrasound probe. With the intravascular ultrasound both the lumen and perivenular structures can be studied clearly[1].

MANAGEMENT

The selection of patient for the intervention is of paramount importance. The benefits of intervention should aim at good cosmetic outcome, symptom relief and prevention of progression of disease by eliminating the underlying cause.

The treatment options available[26] are classified into

1. Conservative treatment
2. Surgical management
3. Endovenous therapy

CONSERVATVE MANAGEMENT

Conservative line of management is done in

1. Pregnancy
2. Patients who do not wish to undergo or unfit for surgery
3. To treat varicose ulcer.

Compression therapy

As it is known that pathogenesis of varicose veins is centered at ambulatory venous hypertension, compression therapy aims at decreasing it. In upright posture the pressure in the lower limb is around 40-60mmHg[1]. Inelastic bandages are superior to elastic bandages in decreasing the venous hypertension. The exact

mechanism of how the compression therapy helps is unclear. It is felt that it may be due to restoration of the microcirculatory hemodynamics. The compression decreases the edema and prevents further extravasation of fluid. With this the cutaneous and subcutaneous diffusion of oxygen and nutrients improve.

Patients must be well educated about the nature of their disease, importance of complying to reduce symptoms and heal ulcers. Graded stockings were first developed in 1950s. Some companies provide customized stockings to fit the anatomic constraints of particular patients. In a study done in 113 venous ulcer patients, use of below knee stockings of 30-40 mmHg pressure resulted in 93% healing rate with mean time of ulcer healing 5 months. Aids like silk liner, butter device have been developed to help patients in the application of stockings[1].

Paste boots

German dermatologist Paul Gerson Unna developed Unna boots[7]. It consists of three to four layers and is usually applied by trained personnel. The first layer has gauze impregnated with calamine, zinc oxide, glycerin, sorbitol, gelatin and Magnesium aluminum silicate[1]. Other layer has continuous gauze dressings. It is applied from foot to just below knee and exerts to a pressure of 50-60 mmHg. The device is changed weekly. It decreases edema and heals ulcer in a meantime of

9 weeks. The disadvantage is that the ulcer cannot be monitored once the boot is applied and trained personnel for application.

Legging orthosis

CircAid is legging orthosis[1] and it contains multiple and adjustable pressure bands. It is similar to Unna boots. This is useful in patients who are unable and unwilling to wear compressive stockings.

Pneumatic compression therapy

These can be used as an option to treat chronic venous insufficiency. They are mainly applicable in patients who are immobile and morbidly obese. CCF is a relative contraindication to its use.

Bissgard method

The conservative method to treat the varicose ulcer is Bissgard method.

1. Elevation of the affected limb[15]
2. Active movements
3. Passive movements
4. Elastic compression stockings with a pressure of 30 to 35 mm Hg.
5. Correct way of walking by placing the heel down first.

Use of topical antibiotics and antiseptics is not recommended unless there is invasive infection. Hydrocolloid occlusive dressing maintains a moist environment and help in rapid epithelial growth. The serotonin II antagonist ketanserin increases the collagen synthesis by fibroblasts and accelerate the wound healing.

Pharmacotherapy

Various agents have been used to treat the manifestations of venous insufficiency. These include zinc, diuretics, fibrinolytic agents, Pentoxyfylline[32], hydroxyrutosides, PGE. But most of them are not universally acceptable and hence not recommended.

SURGICAL MANAGEMENT:

Surgical management of varicose veins has evolved from simple phlebotomy to stripping of the entire diseased vessel. The option should be individualized. Every patient should be thoroughly evaluated and explained about the procedure and its merits and demerits. A preoperative marking of the site with indelible marking with patient in erect posture is important, as the visible varicosities will fade once the patient is put in supine posture.

INDICATIONS FOR SURGERY:

1. Pain
2. Cosmetic reasons

3. Varicose ulcer

4. Bleeding from the varicosity

5. Thrombosis which if untreated may extend into deep system.

CONTRAINDICATIONS:

1. Deep vein thrombosis.

Pregnancy is not a contraindication to varicose vein surgery[28].

SURGICAL OPTIONS

A.LONG SAPHENOUS INCOMPETENCE:

1. Saphenofemoral flush ligation (Trendelenburg procedure)[8,7]

2. Saphenofemoral flush ligation with stripping of long saphenous vein[8,7].

B.SMALL SAPHENOUS VARICOSITY:

1. Saphenopopliteal flush ligation

C.PERFORATORS INCOMPETENCE:

1. Suprafascial ligation of Cockett and Dodd

2. Subfascial ligation of Linton.

D.RETICULAR AND THREAD VEINS:

1. Stab phlebectomy

SURGERY FOR LONG SAPHENOUS VEIN

ANAESTHESIA:

Usually the procedure is done under regional anaesthesia. Nowadays it is also being done under local anaesthesia as a day care surgery.

POSITION:

The ideal position would be supine with adequate drapping.

HIGH LIGATION OF GREAT SAPHENOUS VEIN

This can be done either under regional or local anaesthesia. A 3 cm incision is made just below the groin extending from the site of femoral artery pulsation medially[25]. The subcutaneous fat and fascia is dissected and Great saphenous vein is identified as bluish structure. The five tributaries joining to Great saphenous vein are individually ligated and divided[6]. They should be identified and ligated if stripping is planned as they may result in hematoma formation. The Great saphenous vein is flush ligated. The external pudendal artery lies in the angle of confluence of GSV with femoral vein and act as useful landmark[1].

Double ligation is better than single and the second being suture ligation. Care should be taken not to go too close the femoral vein which will injure it. Rather long stump should not be left behind as it has the risk of thrombus formation and subsequent embolization. If ligation alone is planned a segment of GSV is to be removed to avoid recanalization and recurrence. The use of tourniquet during surgery is still debatable[13,29].

STRIPPING OF GREAT SAPHENOUS VEIN

It is found that if the ligation is combined with stripping[17] of Great saphenous vein the recurrence rate falls drastically. Since the classical stripping from groin to ankle has increased incidence of saphenous nerve damage[12], present day stripping is restricted just below the knee. While planning for stripping care should be taken to exclude the presence of accessory saphenous vein as in their case stripping may worsen the varicosity. After ligating Great saphenous vein, the vein is opened transversely and the stripper is passed from above downwards[6]. The stripper is bought out through a small incision just below the knee joint[1]. An acron is attached to the stripper and the vein is stripped completely by pulling the stripper downwards. Alternatively, invaginated stripping can be done where the vein intussuscepts into itself reducing the trauma to the adjacent structures. Sometimes saphenous vein is susceptible to tear at the points fixed by perforators. In this case a second stripping can be done to remove the entire vein.Tumescent anaesthesia

can be used to decrease the post saphenectomy bruising. Alternatively gauze soaked with a vasoconstrictor agent can be fixed to stripper and so when the vein is stripped, the gauze will pass through the tunnel and minimize the extravasation. The incision should be closed with interrupted sutures. Most important of all is immediate elevation and compression of the thigh after stripping Great saphenous vein.

POSTOPERATIVE CARE:

1. Compression stockings should be applied with a pressure of 30 to 35 mmHg throughout the day.

2. Limb should be elevated[25]

3. Patient should be encouraged to walk from the day one for atleast 5 to 10 minutes.

4. When patient is lying he should be encouraged to move the limb.

External banding valvuloplasty is another option for great saphenous vein incompetence[19]. The principle is to restore the function of the venous valves in the SFJ through extraluminal wrapping of the dilated GSV as a result of which diameter of the vein is decreased and the valve cusps come together[19].

SURGERY FOR SHORT SAPHENOUS VEIN:

ANAESTHESIA:

Short saphenous vein surgery can be done in regional or local anaesthesia.

POSITION OF THE PATIENT:

The patient is put in prone position with adequate padding to bony areas. The knee is slightly flexed.

PROCEDURE:

The incision is made at the site marked by duplex. The fascia is opened and Short saphenous vein is identified. Because of its variable course the vein should be dissected above and below for some length to confirm. The perivenular tissues should be gently dissected so as to avoid injury to the sural nerve during ligation[3]. The Short saphenous vein is transfixed close to the saphenopopliteal junction and divided. Preoperatively, if duplex shows reflex in gastrocnemius veins, it also should be dealt with. After a thorough wash wound should be sutured. Compression stockings should be applied and leg kept in elevation[1].

AMBULATORY PHLEBECTOMY:

Although the major veins are dealt with, the minor veins will drain in alternative pathways will remain as such and will be a major concern for patient both symptomatically and cosmetically[1]. In the past, they were removed by making multiple large incisions which were cosmetically poor. Nowadays it is done by making stabs of about 3mm which is cosmetically acceptable. In these cases after administering local anaesthesia, stabs are made with no.11 blade or 18 gauge hypodermic needle and blood lancet. Instruments used to hold vein are retrieval hooks, iris forceps, and fine pointed clamps. The vein loop is dissected free of fat and is ligated and divided. During the procedure traction should be applied to remove several centimeters from each end. The skin incisions are small that steri strip closure is sufficient.

PERFORATOR SURGERY:

Incompetent perforators result in complications like ankle swelling, eczema, liposclerosis. The incompetent perforators can be ligated and divided either subfascially or suprafascially.

SUBFASCIAL LIGATION

Subfascial ligation of perforators was devised by Linton. Either lateral incision or posterior midline incision is done. In case of lateral approach incision

starts at the junction of upper and middle third of leg and passes along a finger breadth behind the medial border of tibia and end at about 2 cm above the medial malleolus. The deep fascia is opened along the line of incision. On retracting the deep fascia the perforator veins can be seen. Each vein should be individually ligated with absorbable suture and divided.

While closing the wound the fascia should not be closed so as to avoid the compartment syndrome. The skin should be closed with interrupted sutures and compression stockings should be applied. The main disadvantage of this procedure is seroma formation, wound infection and delayed wound healing.

SUPRAFASCIAL LIGATION

In this procedure multiple small incisions are made at the site of perforators preoperatively marked by scan. The perforators are identified joining the saphenous vein. Each perforator is individually ligated and divided. Compared to the Subfascial ligation the wound complications are less in Suprafascial ligation.

COMPLICATIONS OF VARICOSE VEIN SURGERY:

1. Damage to deep veins and arteries

This occurs mainly due to failure in recognizing the anatomy and during attempts to control bleeding by blind clamping. Whenever there is bleeding just

apply firm pressure and elevate the limb. Blind clamping will cause more damage to the vessels. By any means injury to popliteal artery and femoral artery is devastating.

2. Injury to nerves:

The nerve at risk of injury while operating long saphenous vein is saphenous nerve and that of short saphenous vein is sural nerve resulting in sensory disturbance[33]. Since the conventional groin to ankle stripping of great saphenous vein cause saphenous nerve damage in many occasions, nowadays the stripping is done from groin to knee only.

3. Hematoma formation:

The hematoma formation at the site of incision is due to inadequate elevation and compression to the limb[1,3]. This may also occur due to bleeding from the unligated tributaries after venous stripping.

4. Wound infection:

If the procedure is done under strict aseptic precautions, the chance of wound getting infected is less.

5. Thromboembolism:

The risk of DVT after primary venous surgery is low. But in case of high risk patients, who are on Hormone replacement therapy/ Oral contraceptives/ previous history of thromboembolism, it is safe to advocate heparin.

RECURRENCE

The follow up studies have shown a recurrence rate of about 20 – 30% after 5 years. The cause for the recurrence may be inadequate assessment, inadequate surgery and new valvular incompetence[33]. The recurrence was more in the age group of 40-49 yrs of age[33].

ENDOVENOUS THERAPY:

Lesser invasive approaches like endovenous ablation have emerged a lot in the recent past. It was initially approved in the U.S. in 1999[1]. It is known that the main aim in treating varicose veins is to treat the highest point of reflux[1]. As the highest point in most of the cases is Great saphenous vein or Short saphenous vein, these are the targets of the therapy

1. Radiofrequency ablation
2. Laser ablation
3. Sclerotherapy.

4. Cutaneous lasers and intense pulse therapy.

ENDOVENOUS OPTIONS AND INDICATIONS[1]:

TYPE OF TREATMENT	VESSELS TREATED
Radiofrequency ablation	Saphenous vein trunks, saphenous vein tributaries, perforators.
Endovenous laser ablation	Saphenous vein trunk, saphenous vein tributaries, perforators.
Ultrasound- guided sclerotherapy	Saphenous vein trunks, saphenous vein tributaries, perforators, varicose veins not connected to saphenous vein trunk.
Visual or surface sclerotherapy	Varicose veins, reticular veins, telangiectases
Cutaneous lasers and intense pulse light	Reticular veins less than 2 mm, telangiectases

RADIOFREQUENCY ABLATION:

Radiofrequency ablation of varicose vein is emerging as a good modality with little discomfort[17] and downtime for patients. Other advantages are that it can be done under local anesthesia as an outpatient procedure[18].

PREOPERATIVE PREPERATION[1]:

1. Patient is hydrated well so that the vein is nicely dilated.

2. The skin over the vein should be marked under duplex guidance

3. The highest point of reflex which is the target should be marked preoperatively with the duplex.

PROCEDURE:

The point of entry to treat the long saphenous vein is usually below the knee[1]. With the patient in reverse Trendelenburg procedure[36] after infiltrating local anaesthesia, access into the vein is made under ultrasound guidance[3]. A guide wire is passed over which, 7 Fr closureFAST catheter[18] is inserted.The catheter is advanced to the point where the treatment is to begin, which is usually 2 cm below saphenofemoral junction[36]. A tumescent may be injected around the vein which not only reduces the pain but also creates a hydro layer around the vein and minimizes the damage of tissues. Patient is put in Trendelenburg position to assist in vein collapse and apposition. The catheter tip is reconfirmed with ultrasound. With the segmental ablation of closure FAST system, each 7 cm segment[3] is treated independently for a period of 20 seconds. Energy is delivered by pressing the button in the catheter. The temperature generated is around 120 degree Celsius[3]. The catheter is repositioned to the contiguous vein using a 6.5 cm

stepped marks on the catheter shaft and the procedure repeated. The heating of vessel wall obliterates the vessel[36].

Contraindications to Endovenous thermal ablation[3]:

I. Challenging scenarios when one can use ablation:

1. Venous aneurysms or vein diameter > 20 mm.
2. Short vein segments
3. Concomitant deep vein reflux.
4. Deep vein obstruction with well compensated collaterals.
5. Patients on warfarin
6. Thrombophilic patients
7. Recanalised phlebitic veins
8. Tortuous veins

II. Absolute Contraindications

1. Non-ambulatory patients
2. Pregnancy
3. Deep vein obstruction

III. Relative contraindications

1. Allergy
2. Superficial/ subdermal veins
3. Vein diameter < 3 mm.

POST OPERATIVE FOLLOW UP

1. Post operatively patient is advised to wear graded stockings of about 30 – 40 mm Hg for at least 1 week[36].

2. Patient should be encouraged to ambulate soon after the procedure.

3. After 72 hours of procedure, duplex should be done to look for effectiveness of treatment and to rule out extension of thrombus into deep system.

COMPLICATIONS:

1. Thrombus formation.
2. Phlebitis[18]
3. Pulmonary embolism[1]
4. Infection
5. Nerve injury
6. Skin burns.

ENDOVENOUS LASER ABLATION

Laser therapy eliminates reflux with less morbidity[34]. Similar to radiofrequency laser can be utilized to ablate the varicose veins[1]. The preparation of the patient and the procedure are almost similar to radiofrequency ablation.

MECHANISM

It uses bare tipped fiber and delivers laser energy which forms steam bubbles which in turn generates heat[1]. The generated heat damages the endothelium and causes obliteration of vein[3].

DEVICES USED[1]

1. Delta laser
2. Varilaser
3. VNUSClosure Plus

FOLLOW UP:

1. Compressive stockings should be worn for one week.
2. Immediate ambulation to induce vessel obliteration
3. Follow up duplex after 72 hrs.

Laser therapy gives a satisfactory cosmetic outcome to the patient[34].

COMPLICATIONS[1]:

1. Thrombosis and embolism
2. Hematoma and infection
3. Skin pigmentation and paraesthesia
4. Irradiation of non-target tissues.

SCLEROTHERAPY

It is the method of injection of chemical into the targeted vessel to induce endothelial damage and hence the obliteration of its lumen[1]. Done as a outpatient procedure[31].

In the early 1850s the varices were treated by injection of perchloride of iron. Because of high rate of complications the procedure was abandoned during that period.

Now, it is possible to do sclerotherapy with very minor acceptable side effects and good results. The present day sclerotherapy was popularized by Fegan.

INDICATIONS[1]:

1. varicose veins <8mm
2. Reticular veins 2-4mm
3. Telengiectasia 0.1-2mm
4. Recurrent varicosities

5. Failed segments endothermal ablation
6. Unsightly varices of hands and feet
7. Congenital malformations
8. Vascular malformations
9. Facial telengiectases.

After the advent of RFA and laser, the sclerotherapy is used to eliminate veins after the highest point of reflux being treated by one of the two.

CONTRAINDICATIONS:

1. Allergy to sclerosant.
2. Veins of the foot and ankle
3. Post thrombotic syndrome
4. Local skin complications
5. Patients on oral contraceptives.
6. pregnancy[28]

SUBSTANCES USED

The agents commonly used are

1. Hypertonic saline
2. Sclerodex
3. Non chromate glycerin

4. Sodium tetradecyl sulphate

5. Polidocanol[26].

PRINCIPLE:

For smaller veins liquid sclerotherapy is used and for larger veins foam sclerotherapy is used. Veins should be treated from larger to smaller and from proximal to distal[1].

PROCEDURE:

The sites are marked before putting the patient in supine posture. The sclerosing agent is diluted with 0.9 % saline. Several syringes loaded with the sclerosant are kept ready. The concentration used for telangiectasias is 0.125% - 0.25 % whereas for reticular veins 0.25 – 0.5 % and for varices 0.5 – 3.0 %. The agent should be injected into the target vein slowly without any pressure gradient and by occluding on either side to minimize the spread of agent beyond the aimed site. While injecting care should be taken to avoid extravasation from the vein.

BANDAGING:

Soon after injecting the agent, the syringe is removed and bandages applied above, below, and over the injected site. Over these bandages the elastic compression of pressure around 30- 40mmHg is applied for 7 to 10 days. And then

compression is applied for 7 – 10 days at a pressure 0f 30 – 40 mmHg.

Complications[26]:

1. Sensitivity reaction
2. Hyperpigmentation[31]
3. Pulmonary embolism
4. Skin ulceration
5. Urtication
6. Pain.
7. Thrombosis

Advantages of sclerotherapy:

1. Day care procedure
2. No scars
3. Good cosmetic outcome.

CUTANEOUS LASERS AND INTENSE PULSE LIGHT:

These are devices which are able to penetrate the skin and treat the target vein without affecting the skin and subcutaneous tissue[1]. These are usually recommended for veins less than 3 mm in diameter.

DEVICES USED

1. Pulsed dye laser
2. Diode
3. Nd: YAG

MECHANISM:

The principle is the preferential absorption of laser by hemoglobin, with an exposure time that is less than time required for vessel to lose 50% of its thermal energy.

PROCEDURE:

Everyone inside the theatre including patient should be given eyewear. Hand piece is to be placed over the vein and laser pulses are delivered spaced 1 to 2 mm apart. Patients should wear compression stockings for a period of one week.

Complications include utricaria, pigmentation, purpura, pain[1].

SUBFASCIAL ENDOSCOPIC PERFORATOR SURGERY:

Endoscopic sub fascial interruption of incompetent perforators was introduced in mid 1980s by Haucer and Fischer. The superficial vein incompetence should be treated preoperatively or concomitantly.

The zero degree telescope and two 10 mm ports[32]. The endoscope is introduced into the Subfascial plane at about 8 to 10 cm below the popliteal crease. The Subfascial tunnel is created by balloon dissection device and with CO_2 insufflation. The optimal pressure used is around 30mmHg[32].

Subfascial planes are insufflated with ports made for telescope and for working. The perforator veins are clipped and divided by endoscopic scissors individually. Saphenous reflex can also be dealt with in the same way. The operation is done as an outpatient procedure. Compression stockings are applied at the end of the procedure. Patients are discharged within 24 hours after overnight observation. Ambulation is permitted 3 hours after the operation. This is particularly useful in liposclerotic limb[32].

DEEP VEINS REFLUX

None of the treatment modality is both safe and effective for deep vein insufficiency[32]. It can be a primary valve failure or secondary valve failure[32]. Kistner and Taberi did valve repair in femoral vein. The main problem of valvuloplasty is increased incidence of postoperative DVT. Venous bypass is good alternative. External vein valve banding devices and thermally induced collagen shrinkage procedures are other options which are under trials.

MATERIALS AND METHODS

During the period of September 2011 to November 2012, 92 cases of varicose veins were operated in all surgical units in Coimbatore Medical College Hospital, Coimbatore.

For this study 50 cases in the age group of 16 to 70 were taken.

STUDY DESIGN: Comparative study.

INCLUSION CRITERIA:

1. Varicose vein with saphenofemoral valve incompetence and perforators incompetence.

2. Age between 16 and 70.

EXCLUSION CRITERIA

1. Age extremes <16 and >70.
2. Patients with deep vein thrombosis.
3. With associated short saphenous vein varicosity.
4. With venous ulcer or other skin changes
5. Recurrent varicosity.

For all the patients, detailed history, clinical examination, basic blood investigations, chest x-ray, ECG, venous Doppler of the affected limb were taken.

The selected cases were matched for sex, age so as to avoid bias.

Table 1: Age and sex matching

S.NO:	MATCHED ITEMS	WITH VENOUS STRIPPING	WITHOUT VENOUS STRIPPING
1	MALE	20	21
2	FEMALE	5	4
3	16-40 YRS	10	11
4	41 – 70 YRS	15	14

After explaining the procedure and getting informed consent from the patients, they were subjected to one of the two types of surgical treatment modality.

GROUP I

In one group 25 patients underwent Trendelenburg procedure by making a transverse incision of length 3cm just below the groin crease extending from femoral artery pulsation site towards medially. The incompetent perforators in the thigh and leg are ligated and divided subfascially by making small transverse incision across the path of the vein at the site of incompetent perforators marked preoperatively.

Then the long saphenous vein is stripped from groin to just below the knee by passing stripper into the vein.

GROUP II

In the other group 25 patients underwent Trendelenburg procedure is done by making a transverse incision of length 3cm just below the groin crease extending from the site femoral artery pulsation medially. The incompetent perforators in the leg are ligated and divided subfascially by making small transverse incision across the path of the vein at the site of incompetent perforators marked preoperatively.

In both groups the wounds closed with good hemostasis, limb elevated and elastocrepe bandage applied.

All the patients were followed in the postoperative period and for a period of next two months.

The details of all the patients and their investigations, procedure undergone, follow up were recorded in separate proforma for individual patients.

OBSERVATIONS OF THE STUDY

The following observations were recorded by follow up of the patients for a period of two months.

The factors that are taken for comparison are

1. Hematoma formation in the thigh:

All the patients were examined daily in the postoperative period to look for hematoma formation in the thigh.

2. Healing of wounds in the leg at the site of incompetent perforators:

The time taken for the wound in the leg made for approaching the incompetent perforators was noted down. If the wound takes more than 6 days to heal it was considered as delayed and were recorded.

3. Comfortable ambulation without much pain on first post-operative day:

On the first postoperative day, all the patients were encouraged to walk for some time with elastic stockings. The patients who were able to walk comfortably on first postoperative day with minimal pain were recorded.

4. Postoperative hospital stay:

Usually the patients were discharged on third postoperative day. Those who were in the ward for more than 6 days because of pain, delayed wound healing were noted.

5. Pain relief of the patient after two months:

The pain in the affected limb of the patient was enquired and recorded as per visual analog scale preoperatively. All the patients were enquired after two months of the procedure about their pain relief and recorded as per visual analog scale. An improvement of more than five score was considered as good pain relief.

VISUAL ANALOG SCALE:

0 – No pain

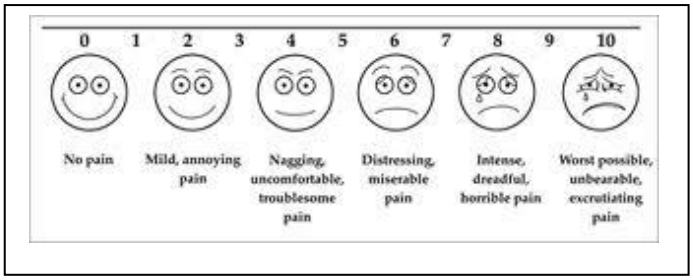
2 – Mild pain

4 – Discomfort

6 – Distressing pain

8 – Intense pain

10 – Excruciating pain.

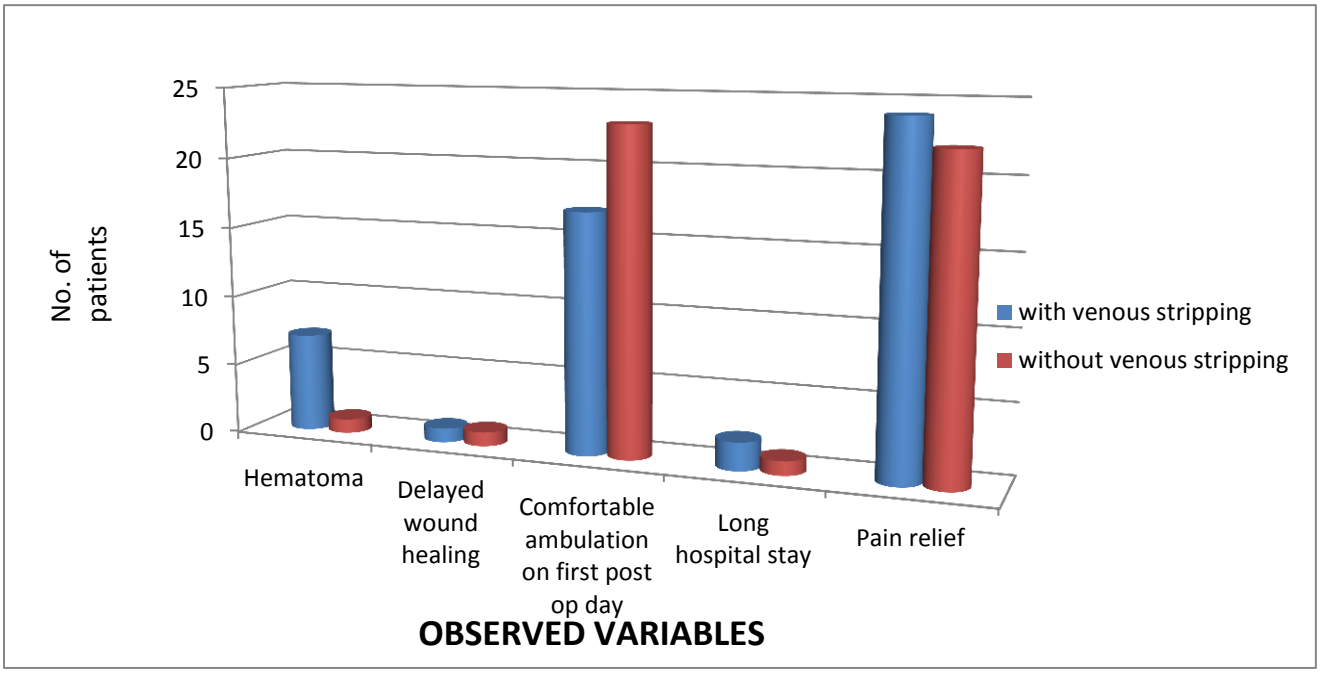


The following table shows the magnitude of all the observed variables in both the procedure and the same is depicted in the bar chart below.

Table 2: Observed results

S.NO:	FACTORS COMPARED	WITH VENOUS STRIPPING		WITHOUT STRIPPING	
		NUMBER (out of 25)	PERCENTAGE	NUMBER (out of 25)	PERCENTAGE
1	HEMATOMA	7	28%	1	4%
2	DELAYED WOUND HEALING	1	4%	1	4%
3	COMFORTABLE AMBULATION ON FIRST POSTOP DAY	17	68%	23	92%
4	LONG HOSPITAL STAY	2	8%	1	4%
5	PAIN RELIEF	24	96%	22	88%

Bar chart : Observed variables



STATISTICAL ANALYSIS OF STUDY AND DISCUSSION:

The two studies were compared statistically to find out whether there is significant difference between the outcomes of two surgical procedures.

The null hypothesis was assumed: That is to begin with it was assumed that there is no significant difference between the two procedures.

By using chi – square test all individual variables were checked for significance.

Since we use 2x2 table, the degree of freedom is 1.If the chi-square value is >3.84, the P value is < 0.05 the difference is significant.

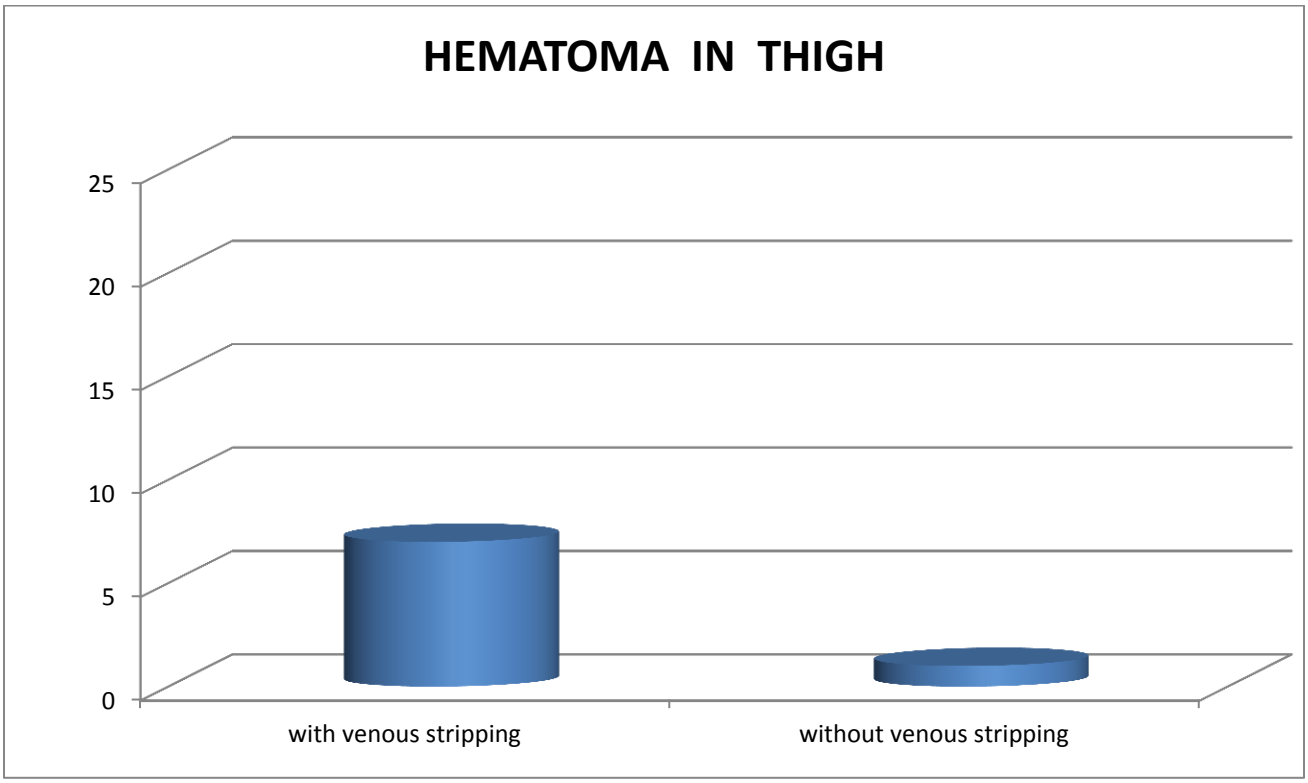
1. HEMATOMA FORMATION IN THE THIGH:

Observed frequency (O)

Table 3: Observed frequency of hematoma formation

PROCEDURE	HEMATOMA IN THIGH	NO HEMATOMA	TOTAL
WITH VENOUS STRIPPING	7	18	25
WITHOUT VENOUS STRIPPING	1	24	25

Bar chart: Observed frequency of hematoma formation



Proportion of hematoma formation = 8/50 = 0.16

Proportion of no hematoma = 42/50 = 0.84

According to null hypothesis expected frequency (E) is,

Table 4: Expected frequency of hematoma formation

PROCEDURE	HEMATOMA IN THIGH	NO HEMATOMA	TOTAL
WITH VENOUS STRIPPING	(7+18)x0.16 = 4	(7+18)x0.84 = 21	25
WITHOUT VENOUS STRIPPING	(1+24)x0.16 = 4	(1+24)x0.84 = 21	25

$$\text{Chi square} = \frac{\sum(O-E)^2}{E} = 5.34$$

Chi square = 5.34 which is more than 3.84. The P value is less than 0.05.Hence it is significant. So the null hypothesis is not true and there is significant difference between the two procedures with respect to hematoma formation.

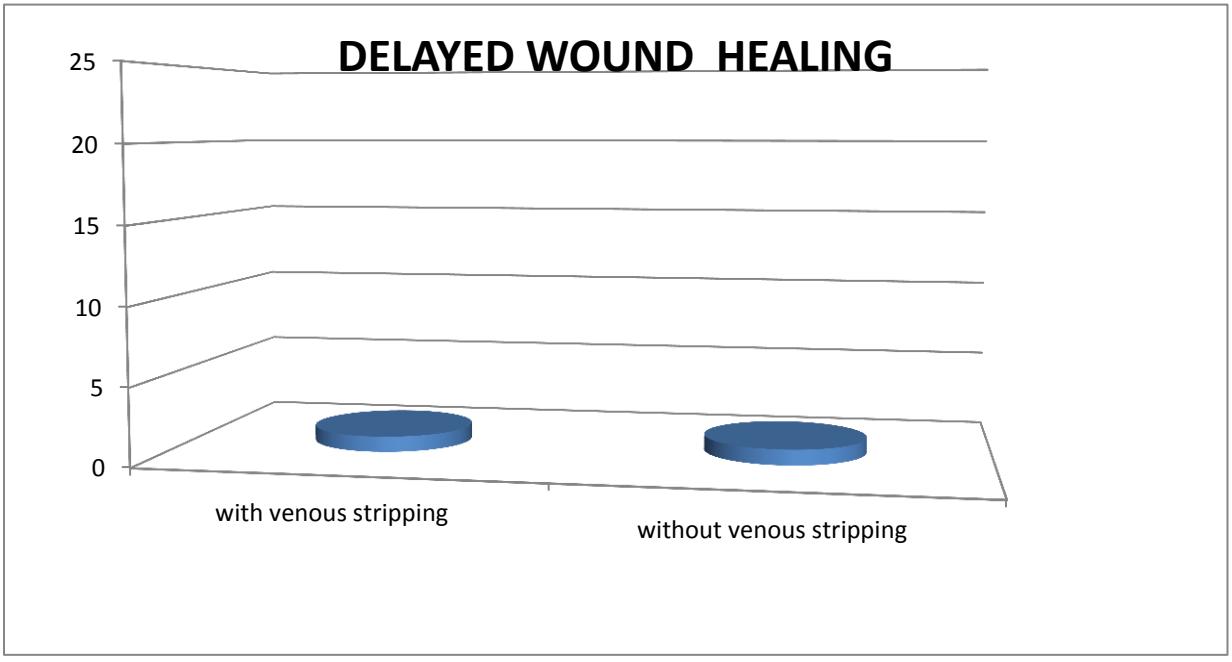
2. HEALING OF WOUNDS IN THE LEG AT THE SITE OF INCOMPETENT PERFORATORS:

Observed frequency (O)

Table 5: Observed frequency of delayed wound healing

PROCEDURE	GOOD WOUND HEALING	DELAYED WOUND HEALING	TOTAL
WITH VENOUS STRIPPING	24	1	25
WITHOUT VENOUS STRIPPING	24	1	25

Bar chart: Observed frequency of delayed wound healing



Since the observations are same in both studies, no need to apply chi-square test to check the null hypothesis.

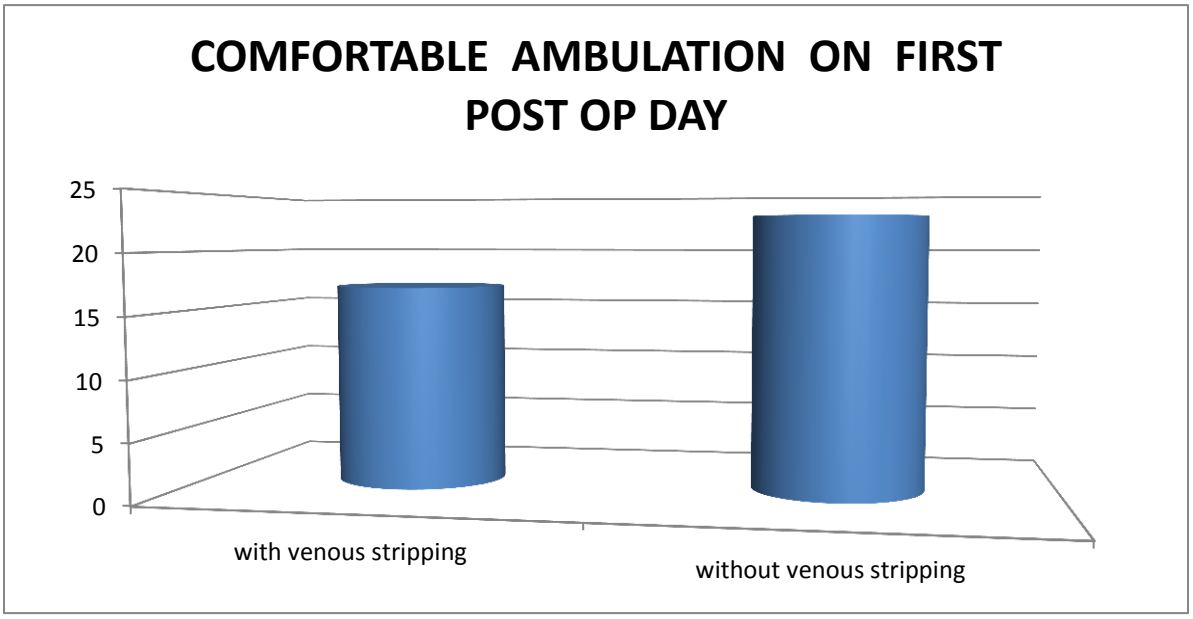
3. COMFORTABLE AMBULATION WITHOUT MUCH PAIN ON FIRST POST OPERATIVE DAY:

Observed frequency (O)

Table 6: Observed frequency of comfortable ambulation

PROCEDURE	COMFORTABLE AMBULATION	PAINFUL AMBULATION	TOTAL
WITH VENOUS STRIPPING	17	8	25
WITHOUT VENOUS STRIPPING	23	2	25

Bar chart: Observed frequency of comfortable ambulation



According to null hypothesis expected frequency (E)

Table 7: Expected frequency of comfortable ambulation

PROCEDURE	COMFORTABLE AMBULATION	PAINFUL AMBULATION	TOTAL
WITH VENOUS STRIPPING	20	5	25
WITHOUT VENOUS STRIPPING	20	5	25

Chi square value is 4.5 which is more than 3.84 and the P value is less than 0.05. Hence the null hypothesis is false. So there is significant difference between the two procedures.

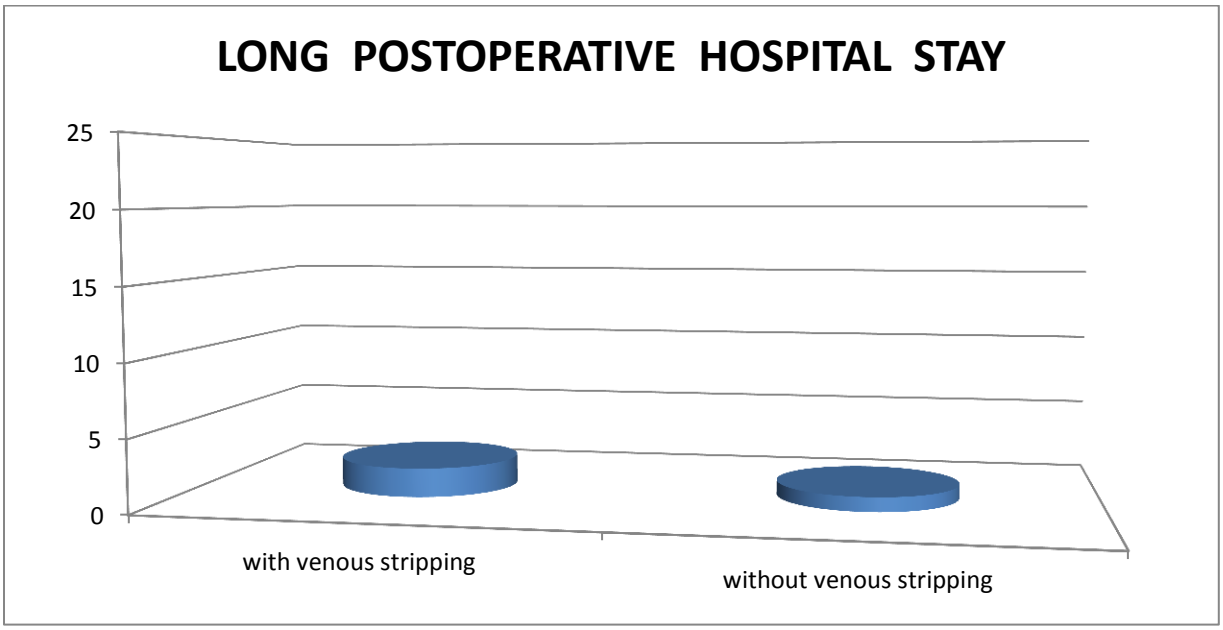
4. LONG POSTOPERATIVE HOSPITAL STAY:

Observed frequency (O)

Table 8: Observed frequency of long postoperative stay

PROCEDURE	<6 DAYS	>6 DAYS	TOTAL
WITH VENOUS STRIPPING	23	2	25
WITHOUT VENOUS STRIPPING	24	1	25

Bar chart: Observed frequency of long postoperative stay



According to null hypothesis expected frequency (E)

Table 9: Expected frequency of long postoperative stay

PROCEDURE	<6 DAYS	>6 DAYS	TOTAL
WITH VENOUS STRIPPING	23.5	1.5	25
WITHOUT VENOUS STRIPPING	23.5	1.5	25

Chi square value is 0.356 which is less than 3.84 and the P value is >0.05. So the null hypothesis is true and there is no significant difference between the two procedures.

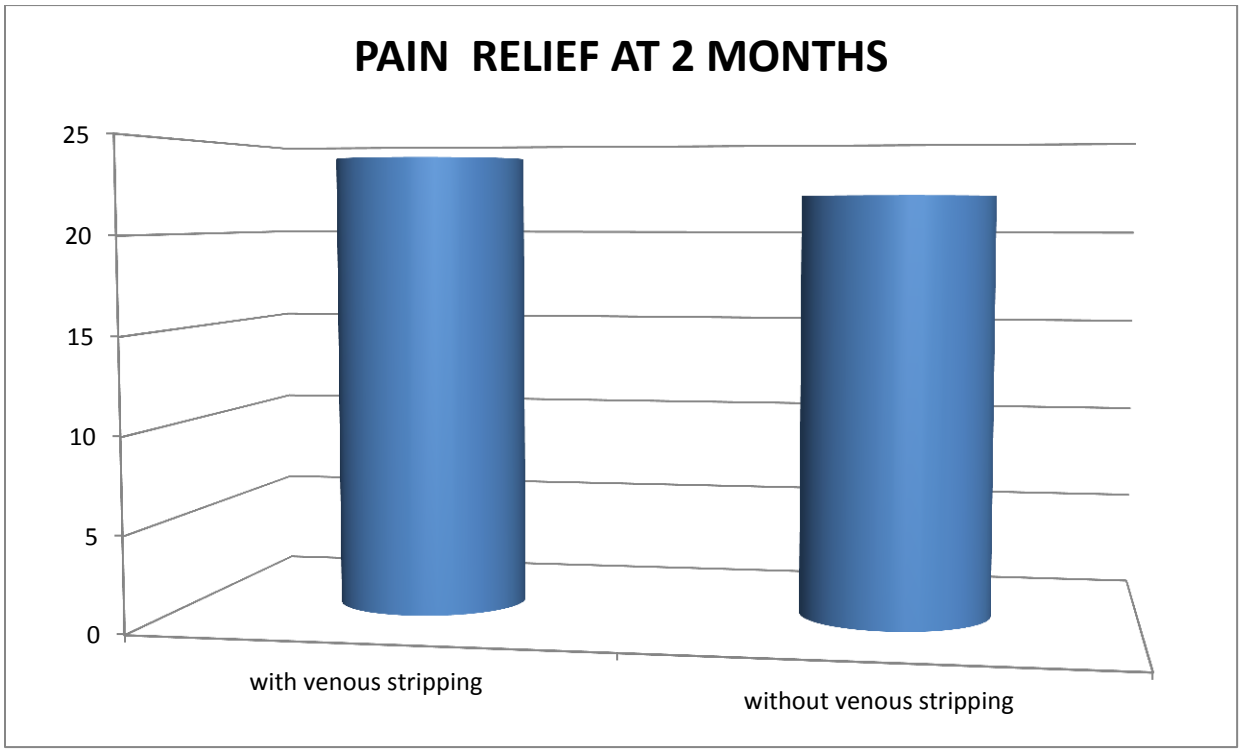
5. PAIN RELIEF AFTER TWO MONTHS:

Observed frequency (O)

Table 10: Observed frequency of pain relief

PROCEDURE	RELIEVED	NOT RELIEVED	TOTAL
WITH VENOUS STRIPPING	24	1	25
WITHOUT VENOUS STRIPPING	22	3	25

Bar chart: Observed frequency of pain relief



According to null hypothesis expected frequency (E)

Table 11: Expected frequency of pain relief

PROCEDURE	RELIEVED	NOT RELIEVED	TOTAL
WITH VENOUS STRIPPING	23	2	25
WITHOUT VENOUS STRIPPING	23	2	25

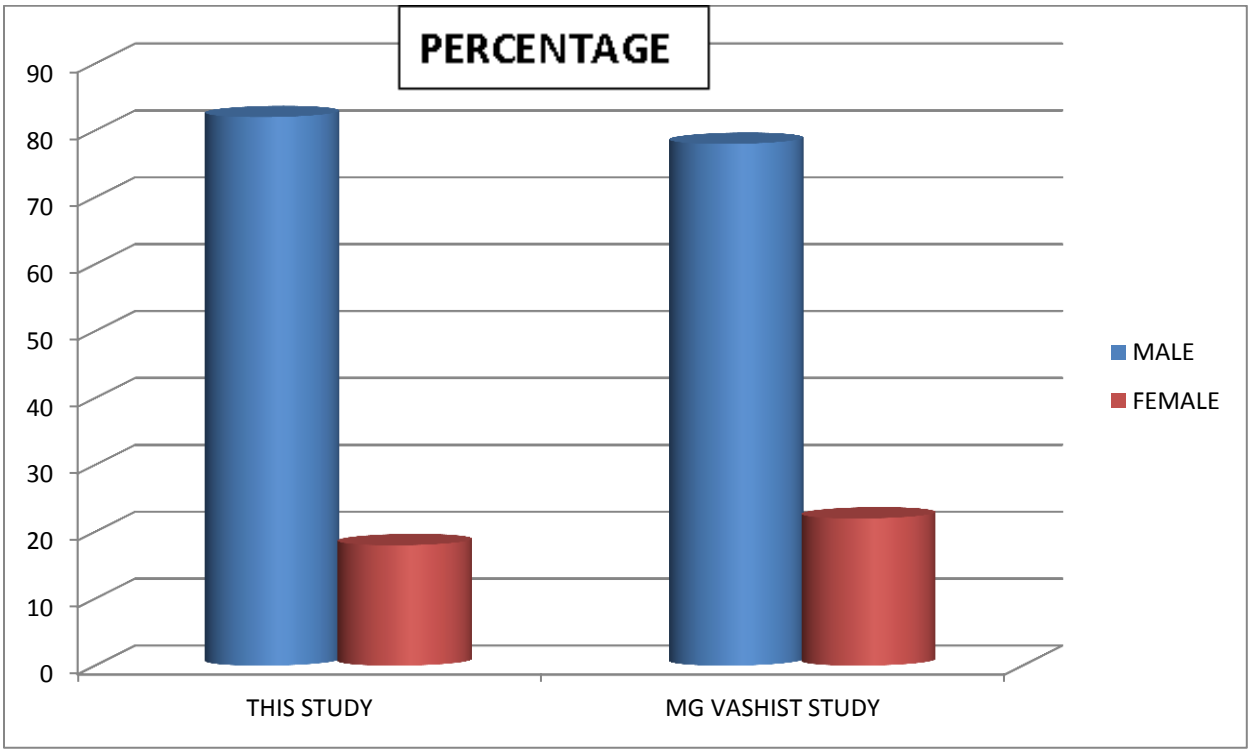
The chi square value is 1.0434 which is less than 3.84 and the P value is >0.05. So the null hypothesis is proved and hence there is no significant difference between the two procedures.

So, among the observed variables, only the hematoma formation and the comfortable ambulation on first postoperative day were significantly different between the two procedures.

DISCUSSION

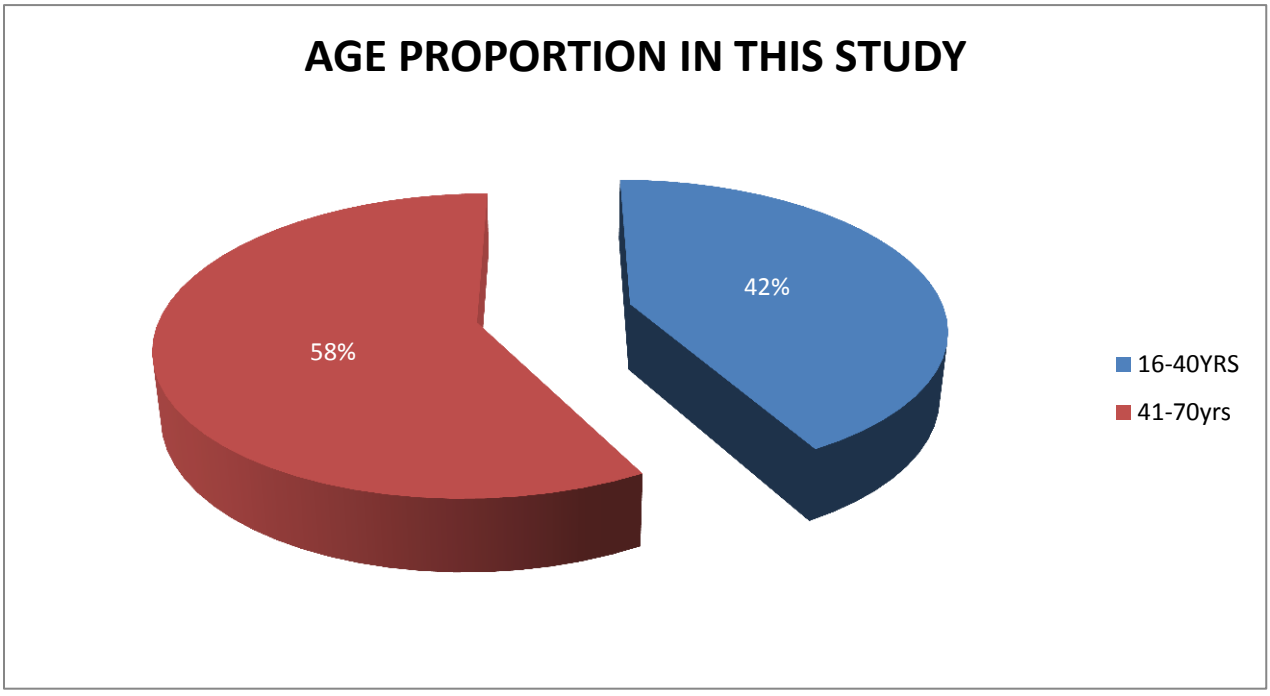
1. Male patients constitute 82%. Among the 50 patients in this study 20 males underwent venous stripping and 21 males underwent procedure without venous stripping. This is comparable to the study by M. G. Vashist, JyotsnaSen, Pawanjit Rohilla: Management Of Saphenofemoral Junction (SFJ) Incompetence In Varicose Veins: Simple High Ligation Or Stripping - A Prospective Randomized Study. The Internet Journal of Surgery ISSN: 1528-8242 in which also the sex was predominantly male.

Bar chart: Sex incidence



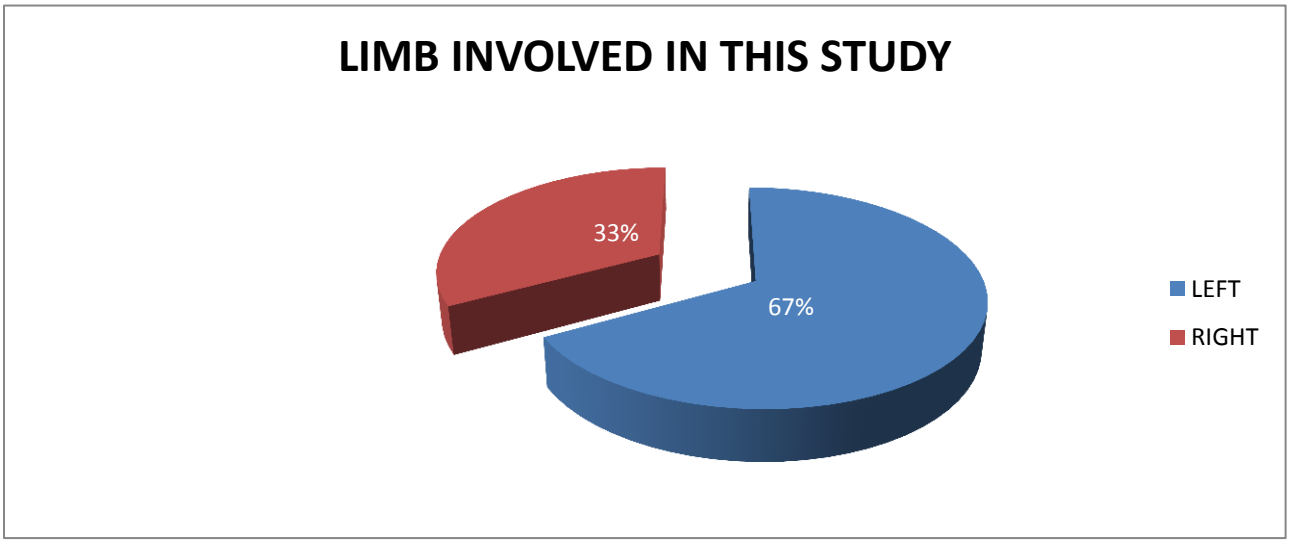
2. This study includes age between 16 and 70. The lowest age in our study is 25 and the highest is 69. The age group of 16 to 40 constitute 42% whereas 40 to 70 age group contribute 58%. In this study 41-70 yrs constitute the majority whereas according to study by M. G. Vashist, JyotsnaSen, PawanjitRohilla:Management Of Saphenofemoral Junction (SFJ) Incompetence In Varicose Veins: Simple High Ligation Or Stripping - A Prospective Randomized Study.The Internet Journal of Surgery ISSN: 1528-8242, the majority of the patients were of the age group 30 to 40 yrs.

Pie chart: Age proportion



3. The left leg was more commonly involved than the right side. The left limb was involved in 66% and the right limb was involved in 33% of patients. The frequency of involvement of the left and the right limbs is shown in the pie chart.

Pie chart: Limb involvement



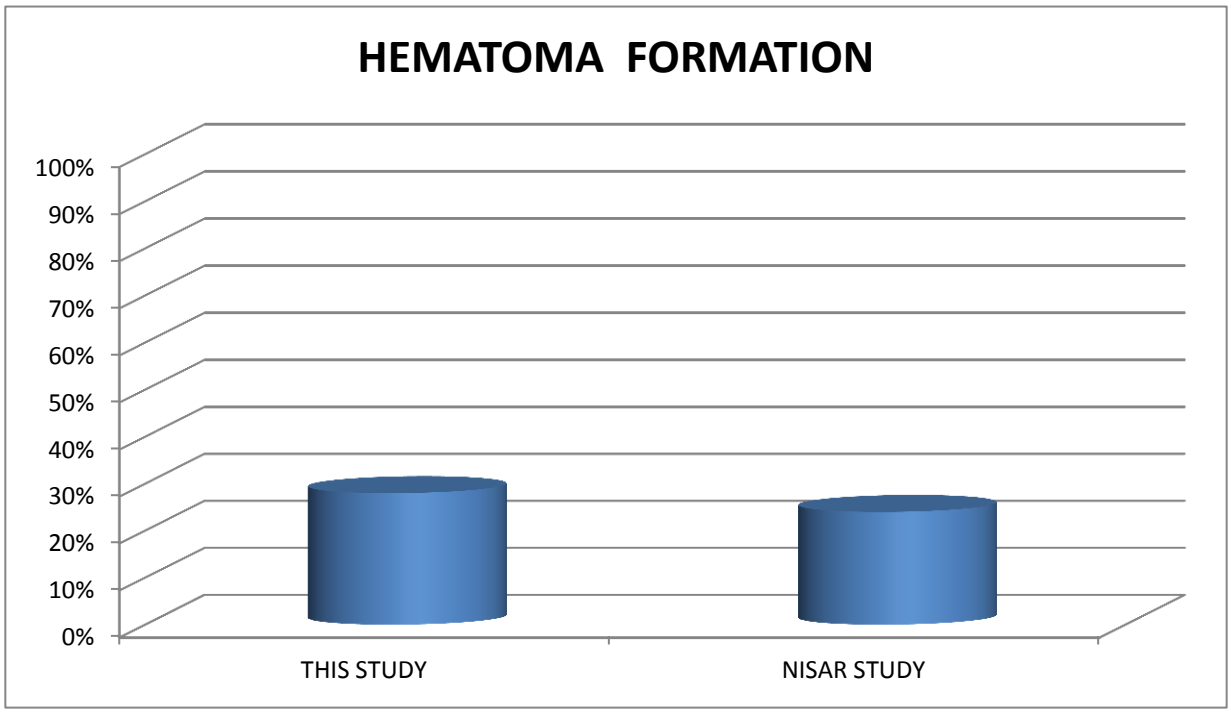
4. The hematoma formation in the thigh was seen in 28% of patients who underwent venous stripping whereas it was seen in 4% who underwent Trendelenburg procedure alone without venous stripping. The hematoma formation with venous stripping in this study is comparable to results of Nisar A, Shabbir J, Tubassam MA, Shah AR, Khawaja N, Kavanagh EG, Grace PA, Burke PE: Local anaesthetic flush reduces postoperative pain and haematoma formation after great saphenous vein stripping--a randomised controlled trial.Eur J VascEndovasc Surg. 2006 Mar; 31(3):325-31. Epub 2005 Oct 19, according to which the percentage of

hematoma formation was seen in 24% of patients. The increased incidence of hematoma formation in the thigh in patients who undergo stripping was due to tissue trauma that occurs during venous stripping.

Table 12: Comparison of hematoma formation

VARIABLE	THIS STUDY	NISAR STUDY
HEMATOMA	28%	24%

Bar chart: Comparison of hematoma formation

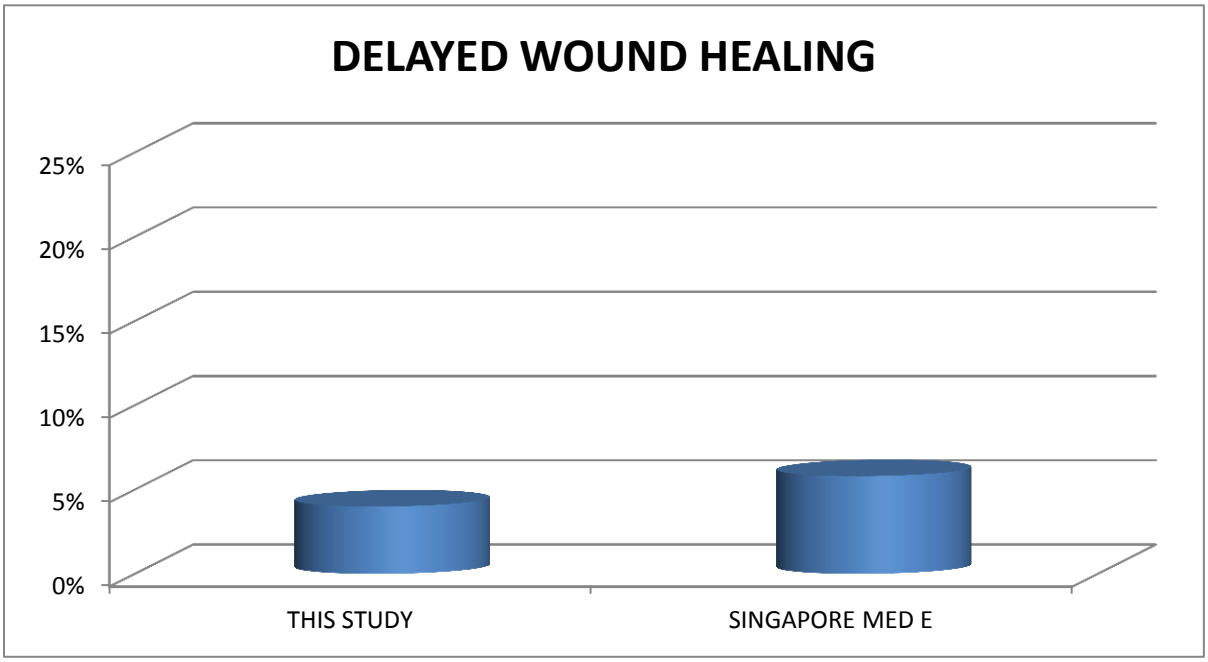


5. In both the groups, the incompetent perforators in the leg were approached by making a transverse incision at the site marked preoperatively under Doppler guidance. These wounds were examined in the postoperative period. 4 % patients in each group had delayed wound healing. This is comparable to the results of M H Kam, S G Tan: Results of long saphenous vein stripping. Singapore Med e J 2003 Vol 44(12):639-642 according to which the wound infection and delayed healing was seen in 5.8% of patients who underwent venous stripping.

Table 13: Comparison of delayed wound healing

VARIABLE	THIS STUDY	M H KAM STUDY
DELAYED WOUND HEALING	4 %	5.8 %

Bar chart: Comparison of delayed wound healing



6. When the patients were encouraged to walk on first post operative day, 68% of those who underwent stripping and 92%from those who underwent ligation alone had comfortable ambulation. It was found that in case of venous stripping, the tissue trauma, hematoma formation bruising and the pain was more.

7. Long stay of more than 6 days was found 8% of those who underwent venous stripping and 4% of those who had Trendelenburg procedure without venous stripping. It was due to pain and delay in wound healing. Subsequently all patients recovered well without much morbidity.

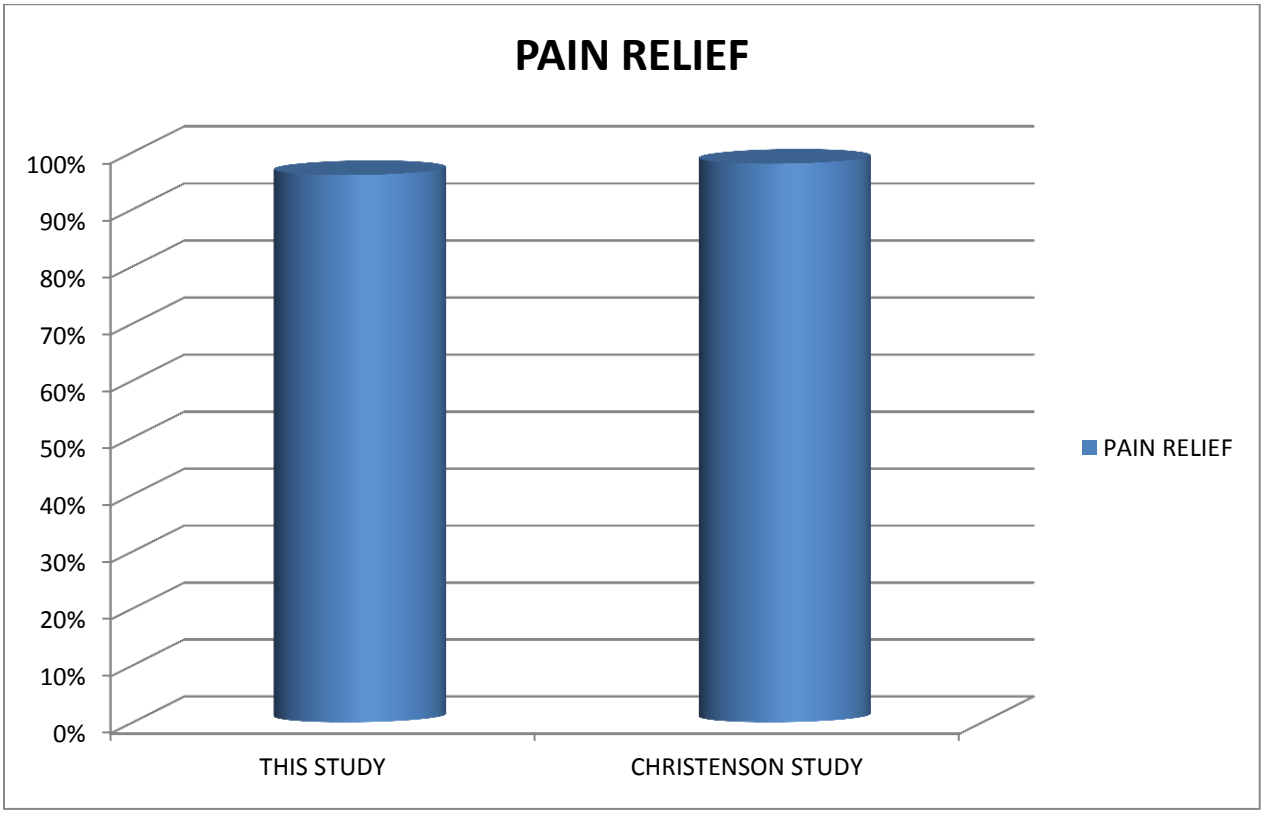
8. At the second month follow up, the symptom relief was there in 96% of patients with venous stripping and 88% of those who didn't undergo venous stripping. This result is comparable to the results of Christenson JT, Gueddi S, Gemayel G, Bounameaux H: Prospective randomized trial comparing endovenous laser ablation and surgery for treatment of primary great saphenous varicose veins with a 2-year follow-up.J Vasc Surg. 2010 Nov; 52(5):1234-41 in which the patients who underwent stripping 98% had pain relief.

Table 14: Comparison of pain relief

VARIABLE	THIS STUDY	CHRISTENSON STUDY
PAIN RELIEF	96 %	98

The pain relief during the follow up period in two studies is shown in the following bar graph.

Bar chart: Comparison of pain relief



SUMMARY

Varicose veins, one of the oldest known diseases of mankind were treated by various modalities starting from simple phlebotomy to minimally invasive approaches.

In this study the outcome of two surgical treatment modalities of varicose surgery with and without venous stripping was compared based upon a follow up period of two months.

Among the 92 patients operated for varicose veins between September 2011 to November 2012 in all surgical units of Coimbatore Medical College Hospital, S50 patients of age group 16 – 70 yrs were taken up for the study after matching.

In this study males contribute the maximum bulk of about 82%. As for as the age is considered, patients aged between 40 – 70 yrs was more, which was about 58%.

The hematoma formation after venous stripping was 28% whereas it was only 4% in the other group.

There was no significant difference in healing of leg wounds in both the studies.

The first postoperative comfortable ambulation with minimal pain was possible in more patients who did not undergo venous stripping (92%) than who underwent stripping (68%).

Long postoperative stay of more than 6 days was found in 8% of those who underwent stripping and 4% of the other group. The long stay was mostly due to pain and delayed wound healing.

Pain relief was seen in 96% of those who had venous stripping and 88 % of those who did not undergo venous stripping at the end of second month.

CONCLUSION

In this comparative study which was done in 50 patients, the observations of short term variables show that the venous stripping has increased incidence of hematoma formation and the ambulation of patients on first post operative day was very painful. With reference to wound healing, hospital stay and pain relief there is no significant difference between the two procedures. So, as for as the variables observed, the Trendelenburg procedure with incompetent perforators ligation without venous stripping appears to be better than Trendelenburg procedure with incompetent perforators ligation with venous stripping.

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MASTER CHART

GROUP I: SAPNENOUS STRIPPING DONE

S.NO	NAME	AGE/ SEX	I.P:NO.	DATE OF SURGERY	DIAGNOSIS	PROCEDURE DONE TRENDELENBURG PROCEDURE WITH LIGATION OF LEG PERFORATORS AND LSV STRIPPING FROM GROIN TO KNEE	HEMATOMA	WOUND HEALING	COMFORTABLE AMBULATION ON FIRST POSTOPERATIVE DAY	POSTOPERATIVE HOSPITAL STAY	PAIN RELIEF
1.	CHINNASAMY	35/M	50148	14.09.11	VARICOSE VEINS RIGHT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
2.	SUDHAKAR	26/M	54890	29.09.11	VARICOSE VEINS LEFT LOWER LIMB	SAPNENOUS STRIPPING DONE	YES	DELAYED	PAINFUL	>6 DAYS	RELIEVED
3.	VARADHARAJ	50/M	57493	10.10.11	VARICOSE VEINS LEFT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	YES	<6 DAYS	NOT RELIEVED
4.	SIVADASAN	53/M	61102	29.10.11	VARICOSE VEINS LEFT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	PAINFULL	<6 DAYS	RELIEVED
5.	AMSA	58/F	64069	21.11.11	VARICOSE VEINS RIGHT LOWER LIMB	SAPNENOUS STRIPPING DONE	YES	GOOD	YES	<6 DAYS	RELIEVED
6.	SAMBAN	38/M	67518	02.12.11	VARICOSE VEINS RIGHT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
7.	GEORGE	69/M	69401	23.12.11	VARICOSE VEINS LEFT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
8.	POOMANI	65/F	3441	21.01.12	VARICOSE VEINS RIGHT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
9.	SAFFURAH	58/M	3610	02.02.12	VARICOSE VEINS LEFT LOWER LIMB	SAPNENOUS STRIPPING DONE	YES	GOOD	YES	<6 DAYS	RELIEVED
10.	NEELAVENI	39/F	6458	07.02.12	VARICOSE VEINS LEFT LOWER LIMB	SAPNENOUS STRIPPING DONE	YES	GOOD	PAINFULL	<6 DAYS	RELIEVED
11.	MUTHULAKSHMI	53/F	20340	30.04.12	VARICOSE VEINS LEFT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	PAINFULL	<6 DAYS	RELIEVED
12.	DHANABALAN	60/M	20962	03.05.12	VARICOSE VEINS RIGHT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
13.	MANIKKAM	29/M	27060	19.05.12	VARICOSE VEINS LEFT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	YES	<6 DAYS	RELIEVED

GROUP I: CONTINUED

S.NO	NAME	AGE/ SEX	I.P:NO.	DATE OF SURGERY	DIAGNOSIS	PROCEDURE DONE	HEMATOMA	WOUND HEALING	COMFORTABLE AMBULATION ON FIRST POSTOPERATIVE DAY	POSTOPERATIVE HOSPITAL STAY	PAIN RELIEF
						TRENDELENBURG PROCEDURE WITH LIGATION OF LEG PERFORATORS AND LSV STRIPPING FROM GROIN TO KNEE					
14.	GANGADARAN	42/M	27835	23.05.12	VARICOSE VEINS LEFT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
15.	RAGUPATHY	39/M	28480	29.05.12	VARICOSE VEINS LEFT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
16.	CHARLES	37/M	33864	15.06.12	VARICOSE VEINS LEFT LOWER LIMB	SAPNENOUS STRIPPING DONE	YES	GOOD	PAINFUL	>6 DAYS	RELIEVED
17.	SELVAM	60/M	30007	02.07.12	VARICOSE VEINS LEFT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	PAINFULL	<6 DAYS	RELIEVED
18.	AMULRAJ	29/M	30588	05.07.12	VARICOSE VEINS RIGHT LOWER LIMB	SAPNENOUS STRIPPING DONE	YES	GOOD	PAINFUL	<6 DAYS	RELIEVED
19.	MUMTAJ	38/F	35852	09.07.12	VARICOSE VEINS LEFT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
20.	SHANMUGA SUNDARAM	47/M	40069	16.07.12	VARICOSE VEINS LEFT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
21.	RAJADURAI	29/M	41073	18.07.12	VARICOSE VEINS RIGHT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
22.	BALAN	50/M	41637	28.07.12	VARICOSE VEINS LEFT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
23.	THANGAVELU	47/M	46811	16.08.12	VARICOSE VEINS LEFT LOWER LIMB	SAPNENOUS STRIPPING DONE	YES	GOOD	PAINFULL	<6 DAYS	RELIEVED
24.	MAKALI	65/M	47932	22.08.12	VARICOSE VEINS RIGHT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
25.	PALANISAMY	41/M	46229	28.08.12	VARICOSE VEINS RIGHT LOWER LIMB	SAPNENOUS STRIPPING DONE	NO	GOOD	YES	<6 DAYS	RELIEVED

GROUP II: SAPNENOUS STRIPPING NOT DONE

S.NO:	NAME	AGE/ SEX	IP.NO:	DATE OF SURGERY	DIAGNOSIS	PROCEDURE DONE	HEMATOMA	WOUND HEALING	COMFORTABLE AMBULATION ON FIRST POST OPERATIVE DAY	POSTOPERATIVE HOSPITAL STAY	PAIN RELIEF
						TRENDELENBURG PROCEDURE WITH PERFORATOR LIGATION					
1.	SURESH	25/M	53823	26.09.11	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	NOT RELIEVED
2.	RAMASAMY	39/M	54897	06.10.11	VARICOSE VEINS RIGHT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
3.	KARUPPASAMY	35/M	57269	22.10.11	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
4.	KUPPUSAMY	48/M	63306	24.11.11	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
5.	TAMILARASI	54/F	3081	20.01.12	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
6.	NARAYANAN	62/M	7360	21.02.12	VARICOSE VEINS RIGHT LOWER LIMB	STRIPPING NOT DONE	YES	GOOD	YES	<6 DAYS	NOT RELIEVED
7.	THANGARAJ	57/M	10650	01.03.12	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
8.	GANESH	56/M	11547	05.03.12	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	PAINFULL	<6 DAYS	RELIEVED
9.	RAJENDRAN	50/M	12980	10.03.12	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
10.	AMIRTHA GANESH	47/M	13777	16.03.12	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
11.	DHANAGODI	52/M	21942	05.05.12	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
12.	SELVARAJ	25/M	24563	25.05.12	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
13.	RAJAGOPAL	36/M	28480	29.05.12	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED

GROUP II: CONTINUED

S.NO:	NAME	AGE/ SEX	IP.NO:	DATE OF SURGERY	DIAGNOSIS	PROCEDURE DONE	HEMATOMA	WOUND HEALING	COMFORTABLE AMBULATION ON FIRST POST OPERATIVE DAY	POSTOPERATIVE HOSPITAL STAY	PAIN RELIEF
						TRENDELENBURG PROCEDURE WITH PERFORATOR LIGATION					
14.	NAGARAJ	37/M	30488	30.05.12	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
15.	SELVAMANI	45/F	32529	09.0612	VARICOSE VEINS RIGHT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
16.	ASHA	26/F	33682	14.0612	VARICOSE VEINS RIGHT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
17.	GOPALAKRISHNAN	43/M	37109	06.0712	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
18.	SELVARAJ	39/M	39307	11.07.12	VARICOSE VEINS RIGHT LOWER LIMB	STRIPPING NOT DONE	NO	DELAYED	YES	>6 DAYS	NOT RELIEVED
19.	LOGANATHAN	29/M	43832	31.07.12	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
20.	RUBI GEORGE	41/M	44664	08.08.12	VARICOSE VEINS RIGHT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	PAINFULL	<6 DAYS	RELIEVED
21.	RAJKUMAR	31/M	45474	09.08.12	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
22.	SANJEEV	46/M	47221	18.0812	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
23.	RANGAN	45/M	47968	24.08.12	VARICOSE VEINS RIGHT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
24.	ESWARAN	37/M	48961	27.08.12	VARICOSE VEINS RIGHT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED
25.	DEVI	25/F	48961	30.08.12	VARICOSE VEINS LEFT LOWER LIMB	STRIPPING NOT DONE	NO	GOOD	YES	<6 DAYS	RELIEVED

PROFORMA FOR A COMPARATIVE

STUDY ON OUTCOMES OF SURGICAL MANAGEMENT OF VARICOSE VEINS WITH AND WITHOUT VENOUS STRIPPING

NAME:	DOA:
AGE/SEX:	DOS:
I.P.NO:	DOD:
OCCUPATION:	ADDRESS:
UNIT/WARD:	

PRESENTING COMPLAINTS:

SYMPTOMS:

1. DILATED TORTUOUS VEINS:
2. NIGHT CRAMPS:
3. SWELLING IN LEG:
4. DULL ACHING PAIN IN LEG:
5. ULCER IN THE LEG:
6. SKIN CHANGES:
7. ABDOMINAL PAIN:

PAST HISTORY:

1. DIABETES MELLITUS:
2. HYPERTENSION:
3. TUBERCULOSIS:
4. PREVIOUS SURGERY:

PERSONAL HISTORY:

1. DIET
2. PREGNANCY
3. SMOKING
4. CONTRACEPTIVE PILLS
5. ALCOHOL
6. BLADDER AND BOWEL HABITS
7. PROLONGED STANDING

FAMILY HISTORY:

TREATMENT HISTORY:

GENERAL EXAMINATION:

1. BUILT AND NOURISHMENT
2. GENERAL CONDITION
3. PALLOR
4. PEDAL OEDEMA
5. GENERALIZED LYMPHADENOPATHY

VITALS:

1. BLOOD PRESSURE
2. PULSE RATE
3. RESPIRATORY RATE
4. TEMPERATURE

SYSTEM EXAMINATION

1. CARDIOVASCULAR EXAMINATION:
2. RESPIRATORY SYSTEM:
3. ABDOMEN:

LOCAL EXAMINATION:

1. LIMB AFFECTED
2. SIZE OF THE LIMB
3. DILATED VEINS
4. SKIN PIGMENTATION AND ULCER

TESTS FOR VARICOSE VEINS:

1. BRODIE TRENDELENBURG'S TEST –1
2. BRODIE TRENDELENBURG'S TEST –2
3. MULTIPLE TOUNIQUET TEST
4. PRATT'S TEST
5. FEGAN'S TEST
6. SCHWARTZ TEST
7. MODIFIED PERTHES' TEST
8. MORRISEY'S COUGH IMPULSE TEST
9. HOMAN'S SIGN
10. MOSES SIGN

INVESTIGATIONS:

HB%:

TC:

DC:

BLOOD SUGAR:

BLOOD UREA:

SERUM CREATININE:

SERUM ELECTROLYTES:

BLOOD GROUPING AND TYPING:

CHEST X RAY:

ECG:

USG ABDOMEN:

VENOUS DOPPLER:

DUPLEX IMAGING:

DIAGNOSIS:

PROCEDURE DONE:

COMPARISON VARIABLES:

1. HEMATOMA FORMATION IN THIGH
2. HEALING OF WOUND AT THE SITE OF INCOMPETENT LEG PERFORATORS
3. COMFORTABLE AMBULATION WITHOUT MUCH PAIN ON FIRST POSTOPERATIVE DAY
4. LONG POSTOPERATIVE HOSPITAL STAY
5. PAIN RELIEF AFTER TWO MONTHS.

PATIENT CONSENT FORM

STUDY: A COMPARATIVE STUDY ON OUTCOME OF SURGICAL MANAGEMENT OF VARICOSE VEINS WITH AND WITHOUT VENOUS STRIPPING

This study has been explained to me in my own language and I understood the following

1. What the study involves
2. That the refusal to participate will not affect my treatment in any way
3. That I may withdraw to take part in this study

Signature of the patient:

Full name of the patient:

Address:

Date:

Witness: (should be a person not connected with the study)

I have been present while the procedure to be performed has been explained to the patient and I have witnessed his/her consent to take part.

Signature of the witness:

Full name of the witness:

Address:

Date:

FIGURE 1: LONG SAPHENOUS VEIN - ANATOMY

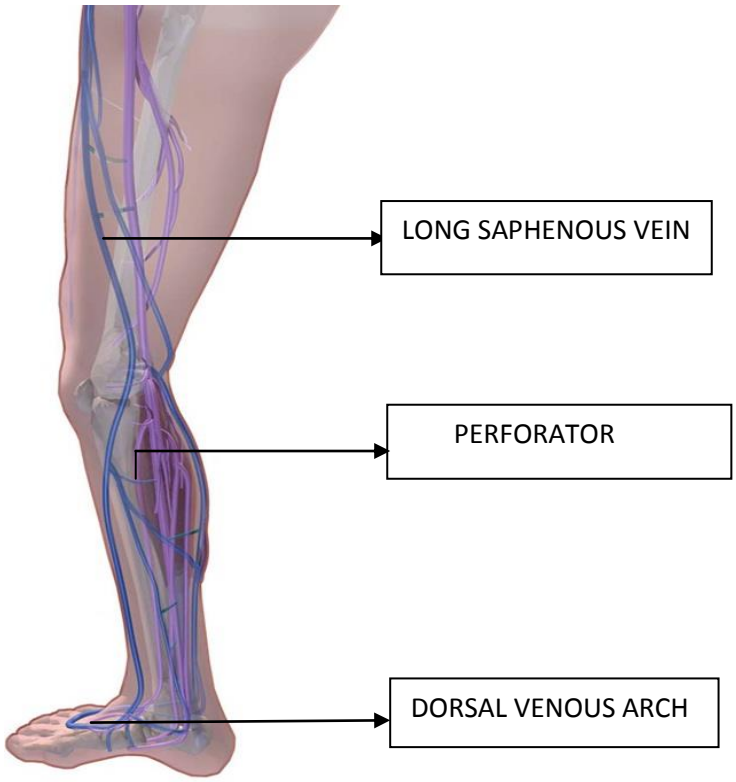

FIGURE 2: SAPHENOFEMORAL JUNCTION

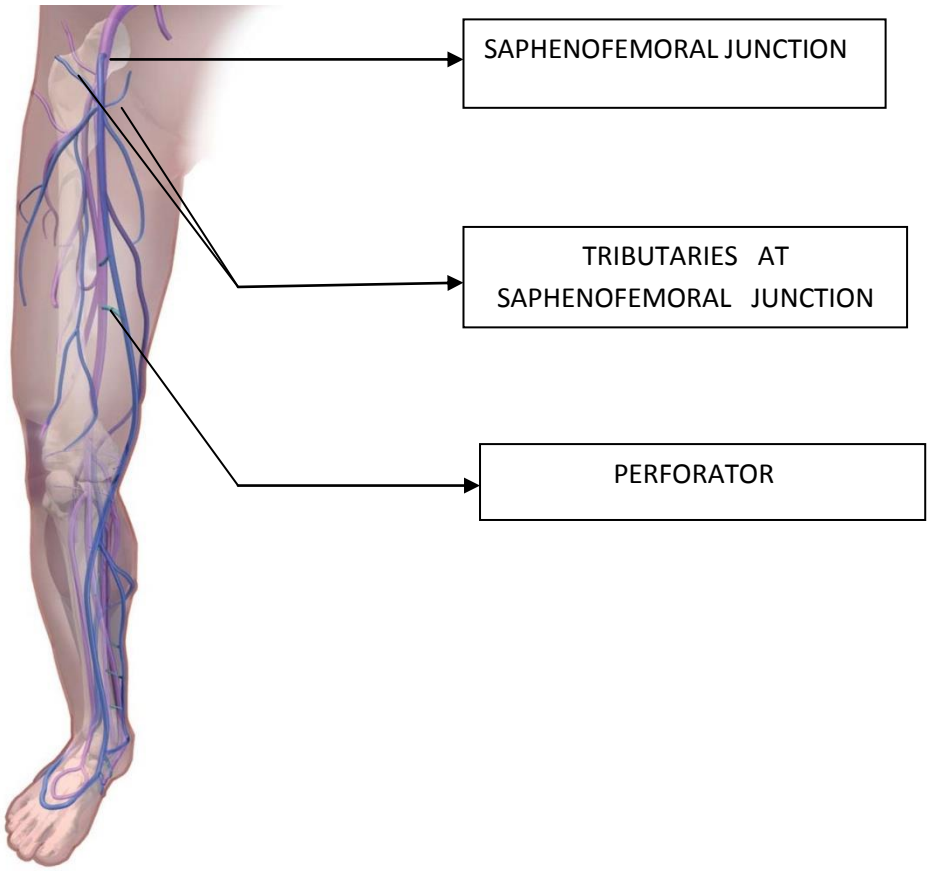

FIGURE 3:LONG SAPHENOUS VEIN VARICOSITY

HYPERPIGMENTATION AT THE ANKLE

FIGURE 4: SAPHENA VARIX

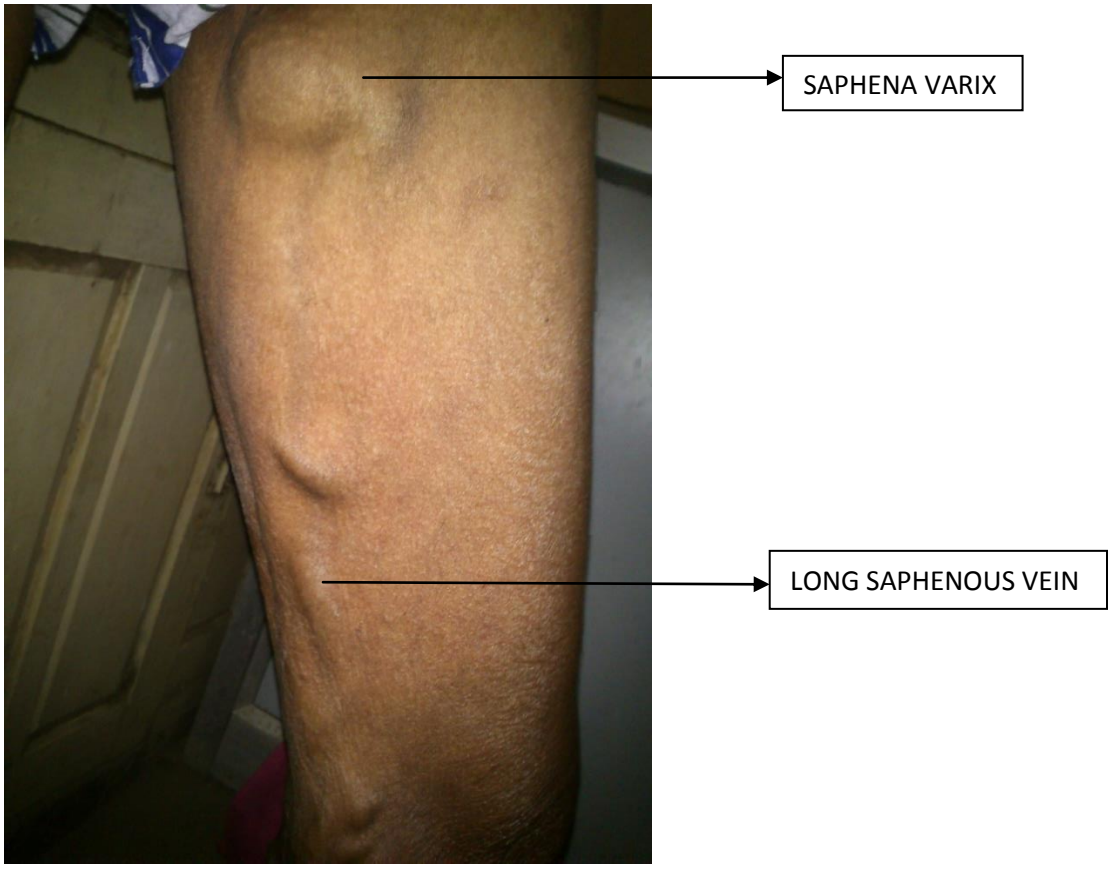

FIGURE 5: BELOW KNEE PERFORATOR INCOMPETENCE

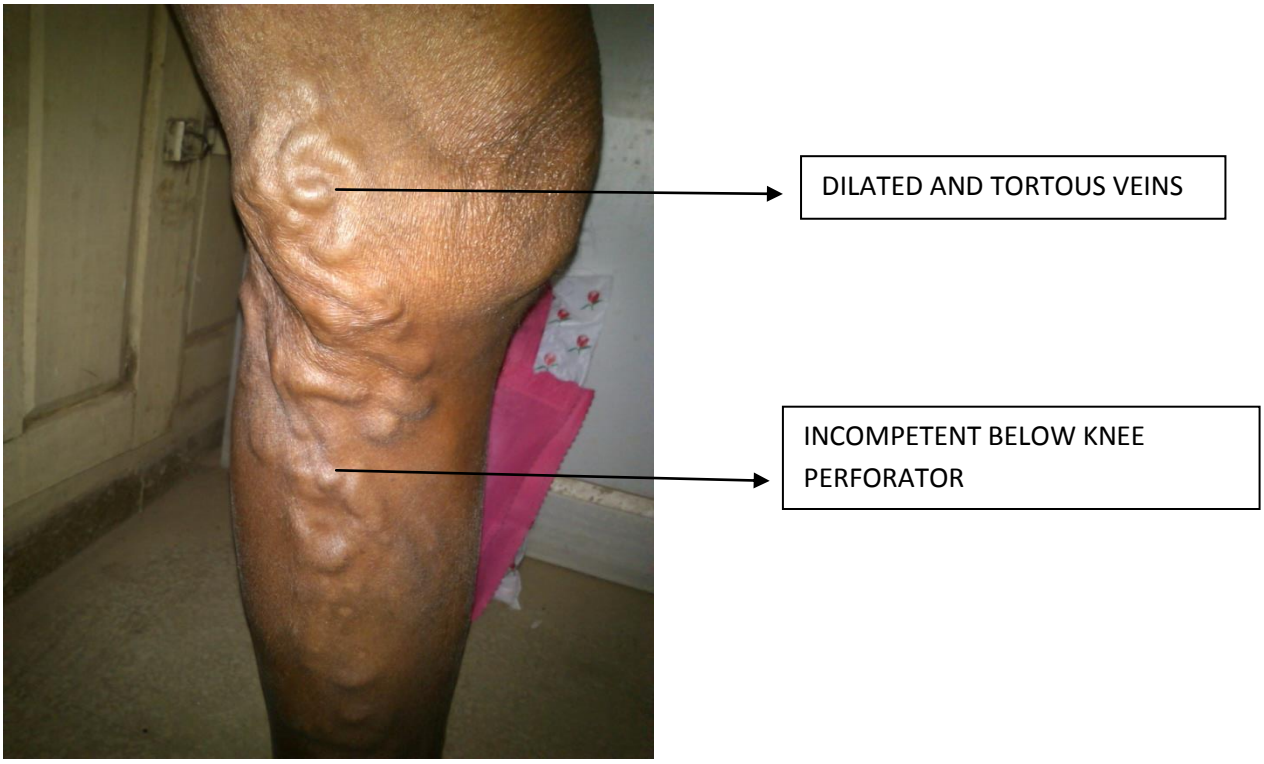

FIGURE 6: PATHOPHYSIOLOGY OF VARICOSE VEINS

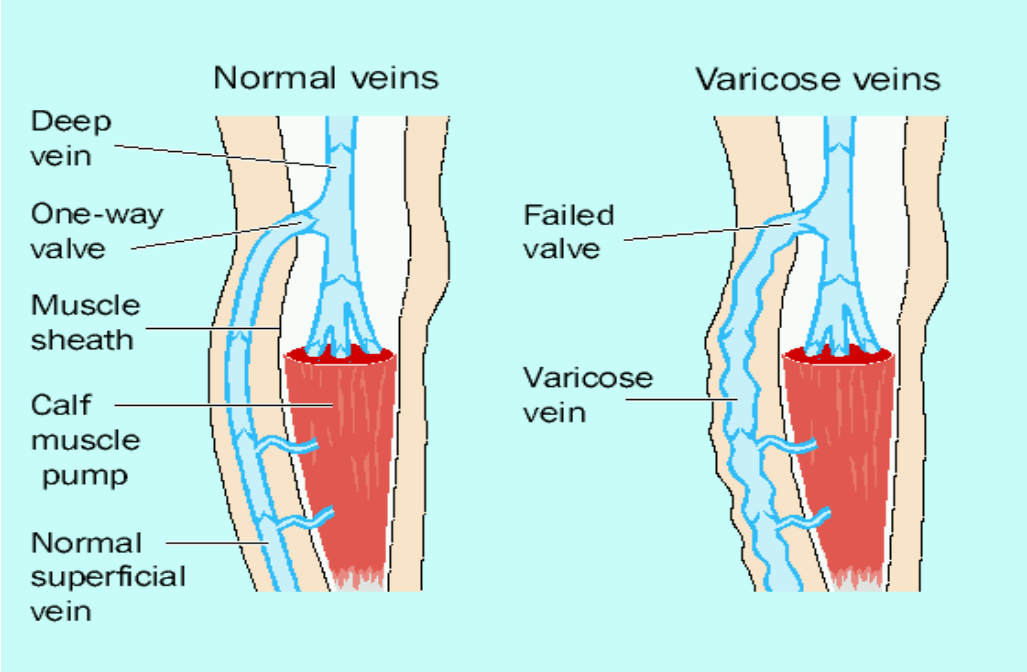

FIGURE 7:VALVE INCOMPETENCE

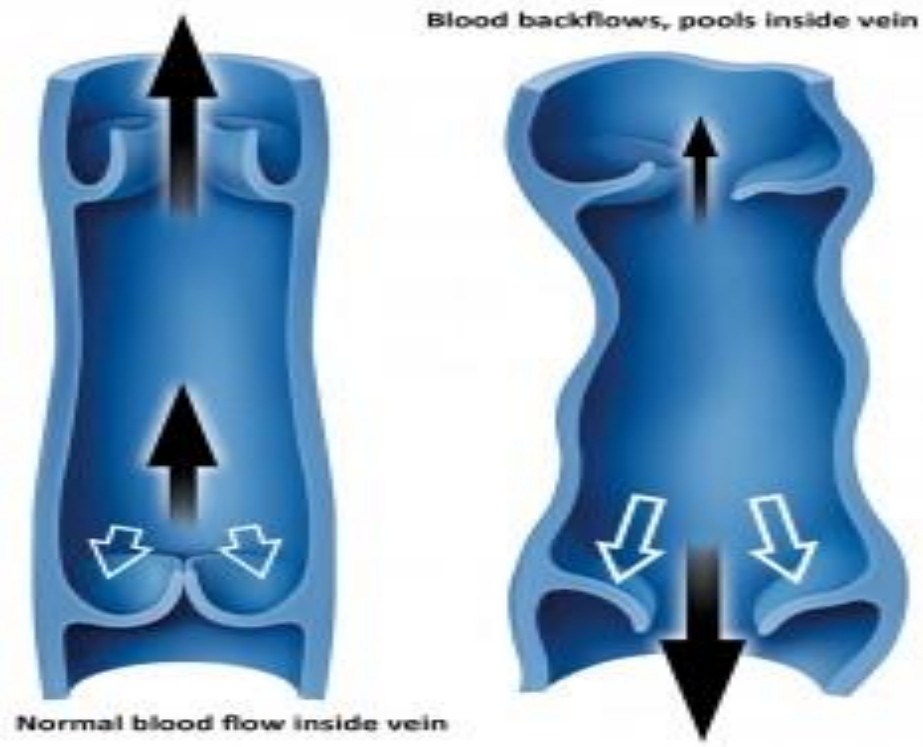

FIGURE 8: COLOUR DOPPLER STUDY – SAPHENOFEMORAL REFLUX

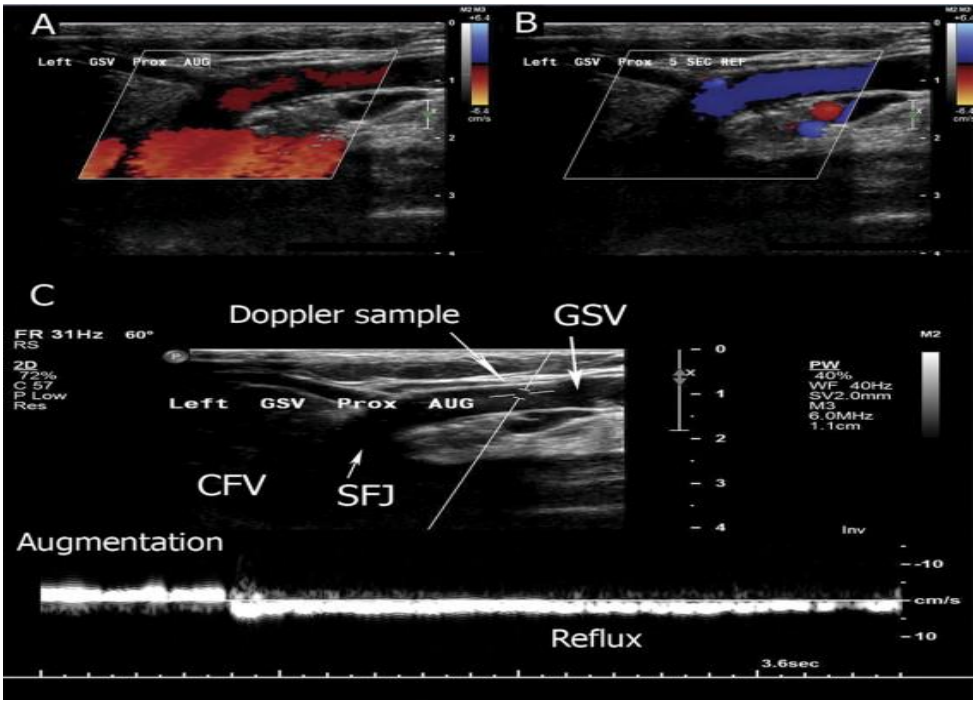

FIGURE 9: COLOUR DOPPLER STUDY – PERFORATOR INCOMPETENCE

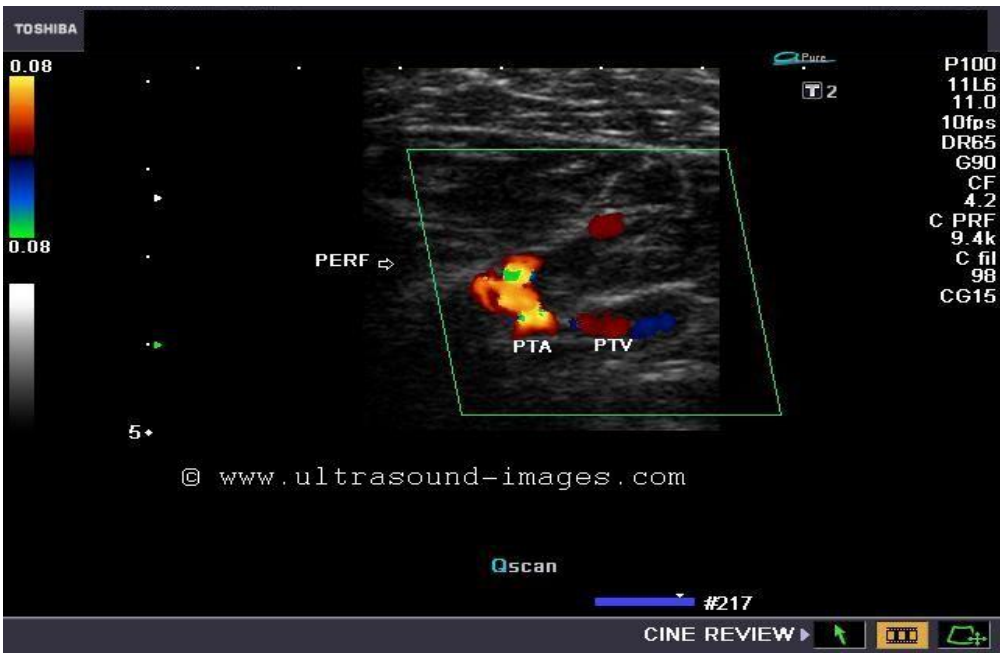

FIGURE 10: TRIBUTARIES AT THE SAPHENOFEMORAL JUNCTION

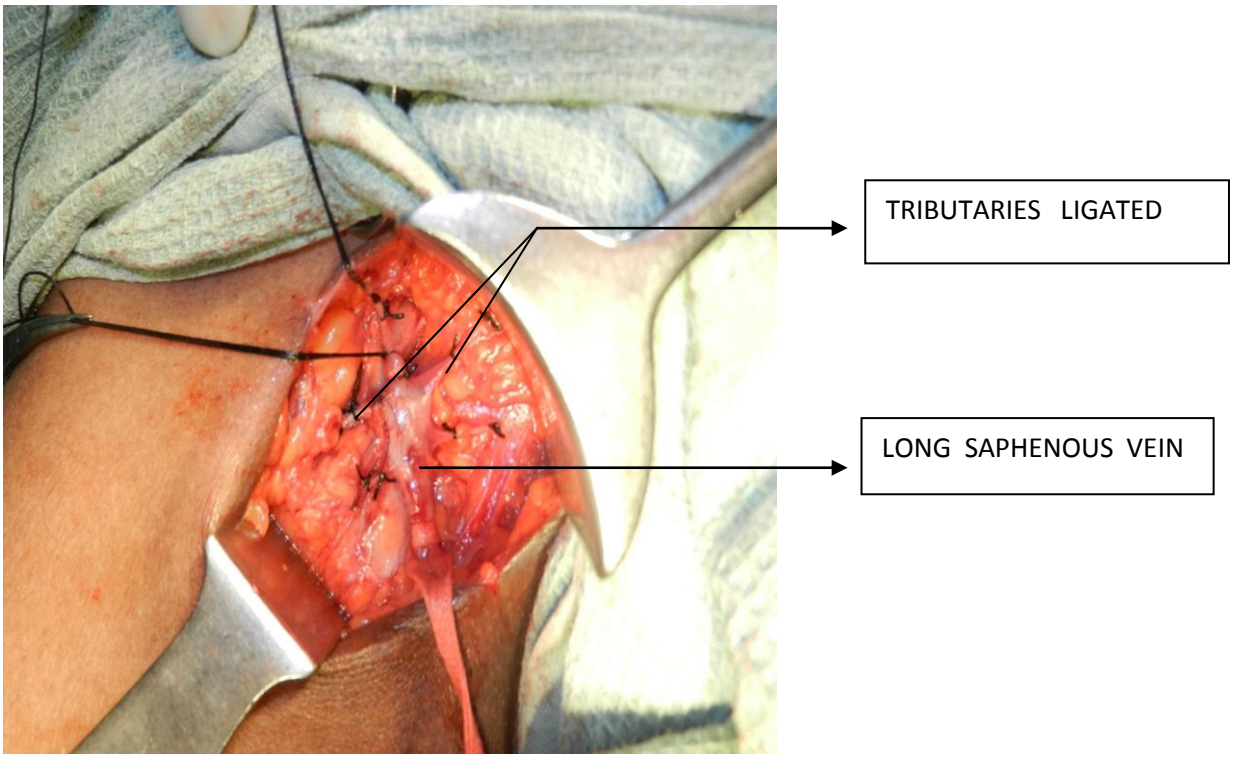

FIGURE 11: TRENDELENBURG PROCEDURE

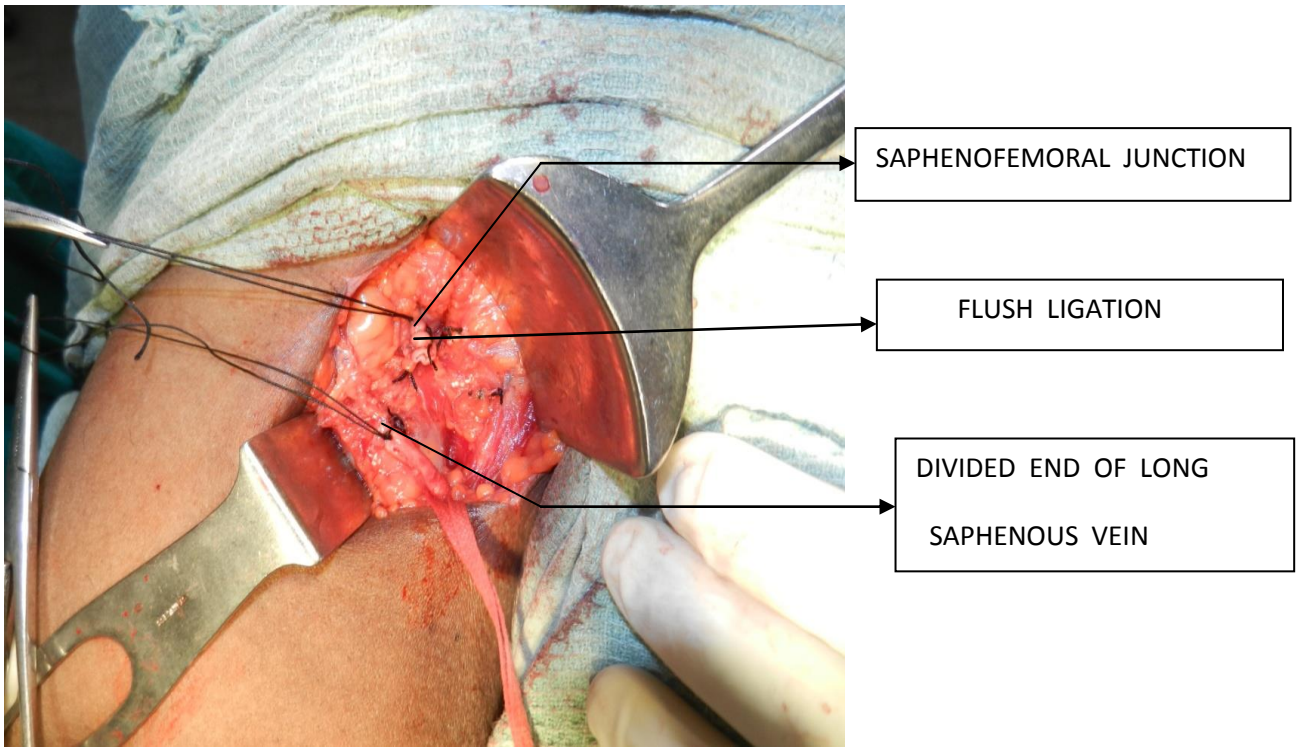

FIGURE 12: LONG SAPHENOUS VEIN STRIPPING

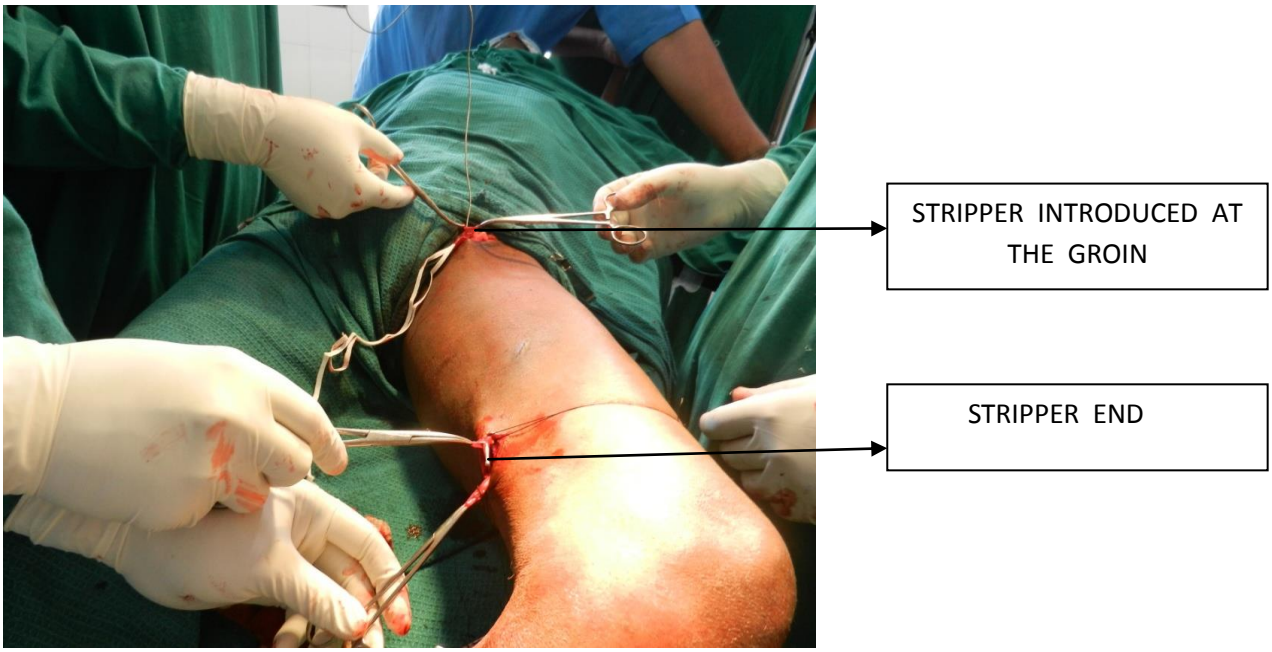

FIGURE 13: STRIPPER WITH STRIPPED VEIN

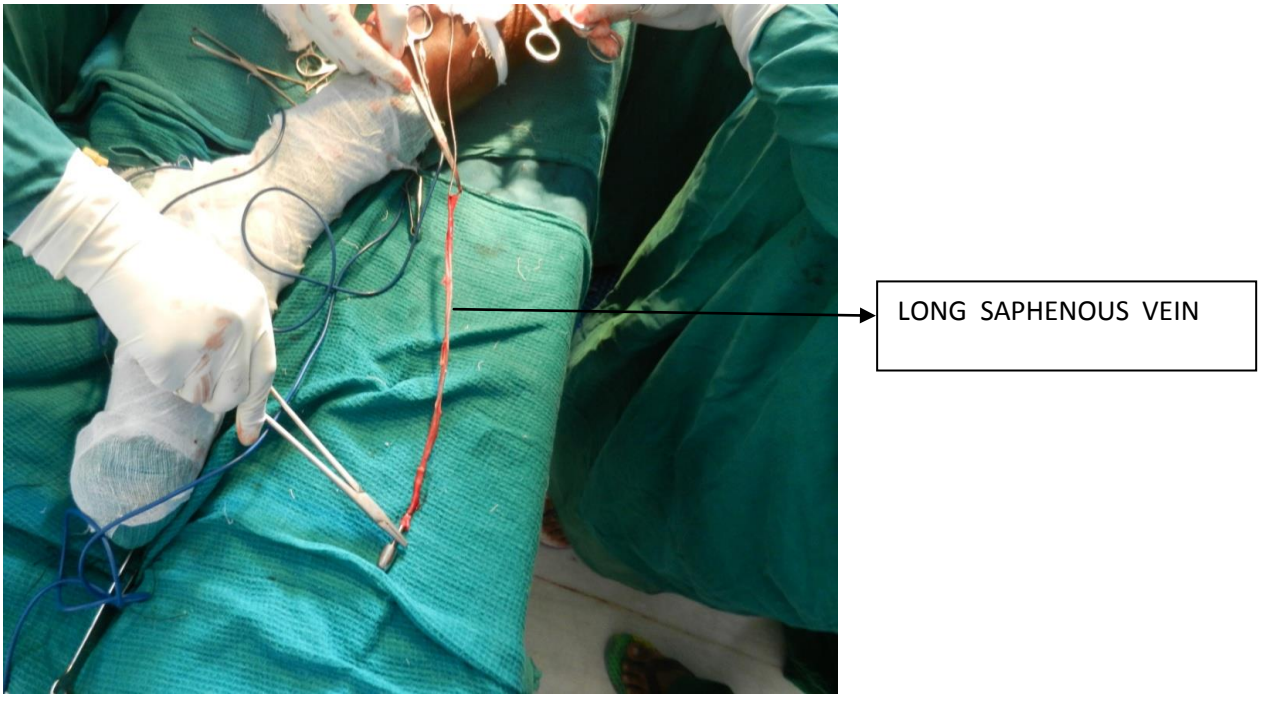

FIGURE 14: STRIPPED LONG SAPHENOUS VEIN